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[Reports]

NCRC 67-1 MacKenzie Reindeer  
operations by Richard M. Hill.





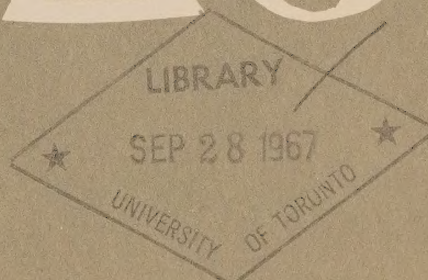


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**MACKENZIE REINDEER OPERATIONS**

**R.M. HILL**

**NCRC 67-1**









# MACKENZIE REINDEER OPERATIONS


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Request for copies of this report should be addressed to Chief,  
Northern Co-ordination and Research Centre, Department of  
Indian Affairs and Northern Development.

Northern Co-ordination and Research Centre,  
Department of Indian Affairs and Northern Development,  
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August, 1967.





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Photo 3 Atkinson Point Reindeer  
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Photo 4 Sven Johansson Manager,  
Canadian Reindeer Project



Photo 5 Distinctive Carving from  
Reindeer Antler



PHOTOGRAPHS 6, 7, 8 & 9

"REINDEER DAYS"

A weekend display of the reindeer herd on Long Lake near Inuvik with dogteam taxi rides around the reindeer and reindeer soup served in the herder's camp. .



Photo 6



Photo 7



Photo 8



Photo 9

PHOTOGRAPHS 10, 11, 12 & 13

General Views of Reindeer Station

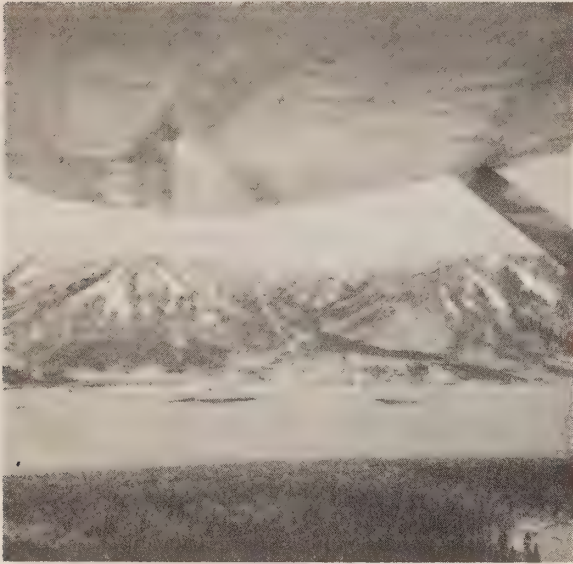


Photo 10



Photo 11



Photo 12



Photo 13



PHOTOGRAPHS



Photo 14 Canned Reindeer Meat (4 oz.)  
from Kasilof, Alaska

Inuvik Hudson's Bay Company Mailing, February 1965

# MEAT SPECIALS

## Beef Sirloin Roasts

Lean and Tender  
BAY DAY

**89c lb.**

## Reindeer Meat

Fresh, Lean. Pre-Cut to your  
specifications.

BAY DAY

**2 lbs. \$1**

Photo 15 Advertisements for Reindeer Meat

# REINDEER

The Inuvik Drum  
January 6, 1966



Buy Reindeer Meat  
For Good Eating

Support Territorial Enterprise

FRESH CUTS Now AVAILABLE.

AT Your Local Store.



## PREFACE

This study of the reindeer industry in the area of the Mackenzie River Delta is a compilation of information and observations which have been collected during the past three years. My interest in the reindeer operations has developed through working on technical research problems of the reindeer in my position as manager of the Inuvik Research Laboratory. This work has put me in contact with the reindeer herd and the operation management as well as administrators, scientists, and local residents connected with the reindeer.

The information presented has been obtained through personal contact and library study. There is a scarcity of applicable knowledge on the North American reindeer operations and certain gaps in the data have been estimated. The concept of modern herding for the Mackenzie reindeer operations has been developed by Sven Johansson, manager of the Canadian Reindeer Project since 1963.

The purpose of this study is to present modern data and comment on the reindeer operations. Hopefully, it will be comprehensible to all and will assist in the intelligent development of the reindeer resource.

Richard M. Hill  
Inuvik Research Laboratory  
INUVIK, NWT





## INTRODUCTION

The Mackenzie reindeer operations have been underway since 1935 when a herd of 2,970 reindeer were driven from Alaska to a Reindeer Grazing Reserve on the East side of the Mackenzie River Delta. The reindeer operations are a government venture initially conceived to supplement the wildlife resources of the region and to improve the economic conditions of the native Eskimos. As the reindeer program did not effectively serve the original purposes of Eskimo welfare, there have been recent changes to reorganize the operations on a self-supporting commercial basis for the benefit of the Eskimo and the North in general.

Reindeer thrive on the harsh Arctic landscape which is desperately short of renewable resources. They provide quality meat products in an area where much of the food is imported. The reindeer maximize land utilization by creating a local resource out of otherwise useless vegetation.

The extent and location of the Mackenzie Reindeer Grazing Reserve are shown in Map 1. The location of the Reserve relative to Western Canada is shown in Map 2.

### Scope of Study

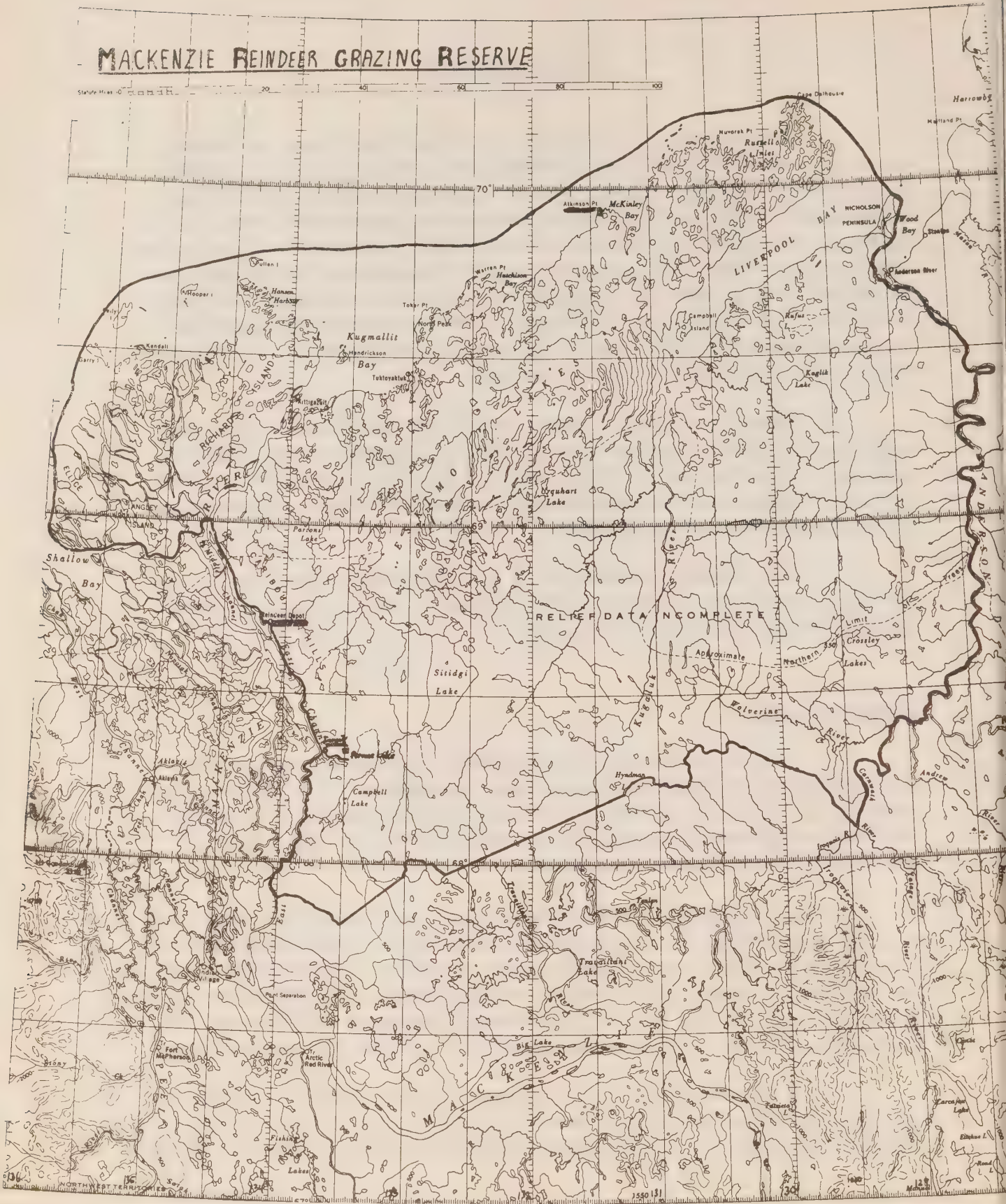
This study has been undertaken to provide a composite description of the Mackenzie reindeer operations. The historical, biological, and economic aspects of the operations are covered to provide comparative information to persons who are interested or involved in the reindeer operations.

Factual information related to the present and future of the reindeer operations is emphasized in this study. Historical details are included only for background comprehension. As the future trends and possible changes in the Mackenzie Reindeer operations are an important part of this study, estimates of expenses and income are emphasized to provide an economic understanding of the operations.

Many persons are interested in the Mackenzie reindeer operations. The residents of the Mackenzie Delta area find employment with the operations. Local businessmen profit from selling supplies

# MACKENZIE REINDEER GRAZING RESERVE

Scale: 1 inch = 20 miles





Location of Mackenzie Reindeer Grazing Reserve



and providing transportation. People throughout the entire Mackenzie District enjoy quality reindeer meat at economical prices. Tourists to the Mackenzie Delta and Arctic Coast find the reindeer a local point of interest. Scientists are interested in the reindeer for Arctic ecology investigations. The reindeer provide the Canadian Wildlife Service biologists with a comparison for caribou studies. Game management officers study the reindeer to determine better methods for game management control. Government administrators at the local, territorial, and federal levels are interested in the reindeer for control and development purposes.

An understanding of the material presented in this study will enable these people to become more familiar with reindeer and reindeer husbandry.

With a more complete knowledge, both the public and the administration will be in a better position to assist in the continuity and effective direction of the Mackenzie reindeer operations.

### Reindeer Husbandry

Throughout all north polar regions there is a particular species of the deer family known as the Rangifer tarandus. In northern Europe and Asia this animal is known as the reindeer, whether it is wild or domesticated. In North America the wild animal of this species is called caribou, while the domesticated animal is called reindeer. The word reindeer is thought to be derived from "reino" which is the old Lapp name for young reindeer (Banfield 1961).

In both Eurasian and Norther American sectors of the polar world, a difference is recognized between the larger animals of the species living in the more southerly forest areas and the smaller animals living in the barren tundra and sparce taiga forests. In Eurasia these larger animals are called forest reindeer and in North America they are called woodland caribou.

There is no biological difference between reindeer and caribou. The distinction between reindeer and caribou in North America is that the reindeer are domesticated to some extent and the caribou are wild. In specific localities the reindeer are distinguished from the caribou by variations in size and general appearance. For example reindeer in the Mackenzie Delta area can readily be distinguished from caribou in the surrounding areas by an examination of facial features, skulls, or leg bones.



The domestication and herding of wild reindeer originated in Northern Asia around 3,000 years ago. Reindeer herding probably was brought to Northern Europe by the Lapps at the time of Christ, but was of secondary importance to hunting and fishing until a specific Lapp reindeer culture developed around the year 1600. A comparable reindeer culture developed in Northern Asia at the same time.

It was late in the 19th century when the first domestic reindeer were introduced to Alaska from Siberia and not until the 1930's when reindeer were successfully introduced to Canada from Alaska.

Presently reindeer husbandry is practiced in Russia, Finland, Norway, Sweden, Greenland, Canada, and the USA (Alaska). It is most highly developed in Russia where considerable research and organization has gone into developing a more productive stock and more efficient methods.

#### Initial Mackenzie Reindeer Operations

The initial step towards setting up the Mackenzie reindeer operations was taken in 1919 when a Royal Commission was appointed to study the possibility of developing reindeer and muskox herding in the Arctic regions of Canada. In 1922 this commission recommended the establishment of reindeer herds in locations to be selected across Northern Canada.

In April 1926 the Danish botanist, A.E. Porsild, and his brother Robert, were appointed to survey areas in the Western Arctic suitable for reindeer. The Porsilds first visited the reindeer operations in Alaska and then surveyed the coastal area lying between the Alaska border on the west and the Coppermine River on the east.

Based on the excellent grazing possibilities reported by the Porsilds in the area east of the Mackenzie River Delta, arrangements were made in Alaska for the purchase and driving of a reindeer herd to the new Canadian range. In December 1929, 3,400 reindeer were selected and started on their way. Over five years later, after a difficult drive along the Arctic coast 2,370 reindeer finally arrived in March 1935 at the Mackenzie Grazing Preserve. This Preserve of 6,600 square miles was set up in 1933 to receive the reindeer. Later in 1952 it was enlarged to 18,000 square miles.

The original purposes of the Mackenzie reindeer operations were mainly to benefit the local population and to conserve scarce game resources. Another motive for the operations was the utilization of the large grazing areas and to keep up with the reindeer developments in other countries with large Arctic and sub-Arctic regions.

The initial Mackenzie reindeer operation was organized to train Eskimo herders and to set up these herders as independent herding units with a number of reindeer supplied from a main government herd. These herding units were to be set up with the understanding that half of the animals supplied would be returned and the remainder become the property of the herders.

In 1938 and in 1940 two native herding units were set up in the Anderson River area. These two herds collapsed when most of the herders and their families were lost in a shipwreck in 1944. The next venture in Eskimo management of a reindeer herd was in 1948 when reindeer from the main herd were set up in the Husky Lakes area. Another herd was started up in the Tuk area in 1951. Both these herds were abandoned in 1955 and the reindeer were recovered by the government. In 1954 another herd was started in the Tuk area which operated until 1964.

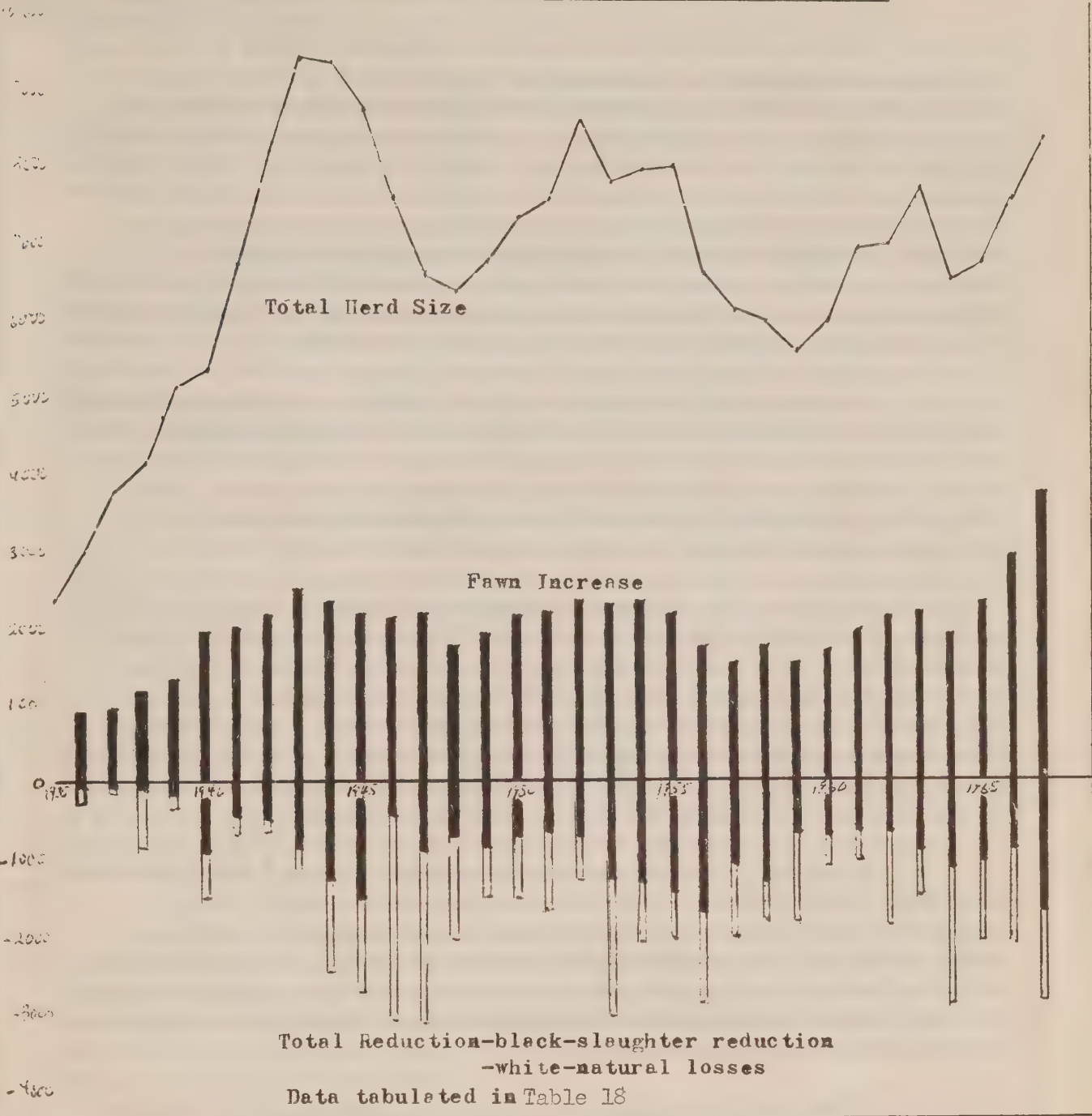
The failure of the native herding units was due to many factors but the main problem was that there was not enough cash generated by the small herd units to survive. The same problem is common to small farmers everywhere in North America. During the initial operations there was a general increase in herd size up to 1943 when herd size fluctuations started as shown in Figure 1.

The herding technique employed during the initial operations from 1935 to 1962 was that of "close" or "intensive" herding, as had been practiced in Alaska and Lapland. This practice involved a constant 24 hour watch over the reindeer with a herder continuously circling around the herd. The intention of this technique was to keep the reindeer tame and to minimize losses from predation and straying. However, during the initial operations thousands of reindeer were found to be unaccounted for at annual roundups.

The purposes of the reindeer operations were directed solely towards the setting up of native herding units throughout the period from the arrival of the reindeer in 1935 up until 1960. The government herd was maintained only to train local herders and to supply herd stock. During these times the government made a sincere effort to make these purposes successful. The herd size, increases, reductions, and losses are shown in Figure 1 for the years 1935 to 1967.



Figure 1  
Mackenzie Reindeer Herd Size, Increases, and Reductions 1935-1967



Amongst the officials involved during this initial period there was sometimes complete optimism for success and at other times pessimism that the Mackenzie reindeer operations would merely be another failure in the broad attempt to introduce industry into the North.

In 1959 a wave of pessimism and criticism of the reindeer operations swept through the government departments involved. It was argued that the cost of running the reindeer operations was not worth the actual or potential benefits to be gained. Some people were openly suggesting that the reindeer operations should be dropped with all the reindeer either being slaughtered or given away.

At this time, there was a change in the reindeer policy from one of training and stock supply to that of a commercial operation where the main government herd would be run on a business-like basis with a program to be self-supporting some time in the future. The remaining native herding unit was to be given some technical and sales assistance, but, in effect, it was left on its own.

An operating contract, embodying commercial possibilities, was set up with John Teal of Burlington, Vermont and Al Oeming of Edmonton. This contract became operational in October 1960 and was taken for five years. Because of staff and management difficulties, the Teal-Oeming contract was terminated in December 1961 and the operations were taken over again by the government. On 15 March 1963 a new contract for a period of two years was signed with Al Oeming as the sole contractor. This contract ran to 31 March 1965.

When Mr. Oeming became contractor in March 1963, a new Canadian, Sven Johansson, was hired as project manager. Mr. Johansson had recently emigrated from Sweden where he had many years experience in reindeer husbandry and trapping. His association with the Swedish Reindeer Experimental Station at Yokkmokk put him in a particularly good position to initiate modern management methods for the Mackenzie reindeer operations.

When the Oeming contract expired in March 1965 it was not renewed. A new contract, with some modifications, was then signed for a period of one year, running to 31 March 1966, with Mr. Johansson as contractor and manager. During the period of this contract it was planned that a forage survey of the Mackenzie Reindeer Preserve would be carried out by the Canadian Wildlife Service and that an economic survey would be prepared by another agency.

## Present Operations

The present contractor operates as the Canadian Reindeer Project and personally manages the operations from Reindeer Station. A modernization program has been set up for all phases of the operations. Several major changes have been initiated with the purpose of developing the Mackenzie reindeer operations into an effective self-sufficient industry.

The productivity per employee was greatly increased by providing efficient transportation and communication. Aircraft were introduced for regular reconnaissance patrols and for moving herders between camps and Reindeer Station. Winter travel with the herd was improved by building up the number of good sled dogs so that each herder has a strong, working dog team. Summer travel was facilitated by the purchase of freighter canoes with outboard motors for moving with the herd along waterways and along the Coast.

Communications were greatly improved by setting up a high frequency radio network with a base station at Reindeer Station and portable radios with every herding team and at slaughter camps. An arrangement was made for standby radio service in Inuvik for handling airplane charters, sales arrangements, and emergencies.

Coupled with the modernization of the transportation and communications, a radical change in the herding methods was initiated. The "close" herding, which had been practiced since the operations began, was replaced with "open" herding where the reindeer were allowed to graze and move about on their own free will unless being driven to a roundup or slaughter. This method only requires supervision of the herd by air survey and ground reconnaissance.

At Reindeer Station the homes were reinsulated and oil heaters installed to replace the wood stoves. An operations compound was organized and surrounded by a security fence to concentrate and protect the operation stores and equipment. Boats and equipment surplus to the needs of the operation were returned to the Department of Northern Affairs and National Resources.

With these improvements to transportation, communication, housing, and stores control, plus the change in herding methods, the project was able to operate more effectively with a smaller staff. Only eight employees, including the manager, are now required to handle all the operations. The employees are paid well and are fully equipped for their work. With purposeful employment, good wages, and warm homes, the employees now have a new pride in their work and in themselves. Previously a staff of up to 22 persons was required to handle the reindeer operations.



All of the government reindeer were merged into a single herd where previously there had been a herd in the Richards Island-Reindeer Station area, and a herd in the Cape Dalhousie-Husky Lakes area. There was also a No. 4 Native herd which was casually grazed around the Tuktoyaktuk area. Although \$10,000 worth of products were sold by the Reindeer Station operations in 1963/64 on behalf of the No. 4 herd, the Eskimo partners requested that they be allowed to surrender their herd. This was completed in August 1964 and at this time 1041 reindeer were transferred to the main government herd.

With only one herd and one management in the Mackenzie Reindeer Reserve, a significant herding change was possible. With the introduction of open herding, the Mackenzie reindeer operations could now become the most efficient in the entire world.

Small inefficient herding units confined to small areas are common in all reindeer countries. This situation has held back reindeer developments in these countries. The same limitations of small herds had been imposed on the Mackenzie Reindeer operations as there were always problems of herd mixing and disputes over grazing areas. With the withdrawal of the last Native herding unit, it was possible to proceed with increasing the size of the herd and to make full use of the entire Reserve.

With effective management the Mackenzie reindeer operations could now evolve into a large, efficient herding unit and be in a position to develop extensive markets for reindeer products. The material presented in this study is orientated towards evaluating the factors influencing this new era in the Mackenzie reindeer operations and the opportunities for large scale grazing.

I REINDEER PRODUCTS

- Introduction
- Dressed Meat
- Edible Byproducts
- Nonedible Byproducts
- Live Sales

## CHAPTER I

### REINDEER PRODUCTS

#### Introduction

Reindeer meat is a high-quality product which can readily compete with beef and other domestic meats in both northern and southern marketplaces. The success and volume of reindeer meat sales will depend on quality control, skill in pricing, adaption to the market, and effective merchandising.

Reindeer meat is distinctive and delightful. Both professional and home gourmets eagerly offer reindeer as a specialty. Reindeer meat is low in fat, high in protein, and rich in minerals as compared to beef. This makes it especially attractive to weight watchers who still enjoy a good meal. Reindeer meat has both the pleasant connotations of game and a natural goodness which does not require spices and herbs as do most wild meats.

At several large banquets in recent years at Inuvik, reindeer meat has been served and both visitors and local people have commented on its "goodness" and were unable to differentiate it from beef. With skill exercised in herding and slaughter procedures, reindeer meat is readily accepted in all markets as a quality product. Figure 2 gives quotations from letters that have been voluntarily sent to comment on the "excellence" of reindeer meat.

The basic market for reindeer products is in the North where people are long used to reindeer and caribou and where the marketing economics favour better pricing relative to imported meat products.

Also in the North people tend to have more meat in their diet. The people of the Mackenzie Delta prefer reindeer meat to any other. Presently, the local demand for reindeer meat is considerably in excess of the available supply from Mackenzie reindeer operations.

The president of the Inuvik Chamber of Commerce recently hosted a "reindeer steak" dinner in Myrtle Beach, South Carolina. This promotion was well received and initiated a clamour for the purchase of reindeer products.



Figure 2

Unsolicited Testimonials for Reindeer Meat

Letter received from Hay River dated 26 January 1965

"May I take this opportunity to praise the quality of the meat distributed by you. This being my first experience with reindeer, I was surprised at its fine texture and tenderness."

Letter received from Camp No. 8, Great Slave Lake Railway, dated 26 February 1965

"The supervising engineer made some of the reindeer meat available to the cookhouse, and since this was my first experience with reindeer I was entirely pleased with the results."

Reindeer products involve the complete animal as, in the economic sense, every part of the animal can be sold or utilized by the reindeer operation. A comparison can be made with the beef packing house industry where every part of the cattle is processed for profitable sale. Normally, a beef packing house just breaks even on its meat sales but keeps profitable by full utilization and sale of the byproducts such as hides and offal (Fowler 1957). The same economic situation could hold true for the reindeer industry.

Reindeer meat by the carcass has been the basic item sold by the operations from the beginning in 1935 up to the present. For economic operations on a commercial basis, all parts of the reindeer will have to be utilized with an organized program for optimum income.

However, as there are great distances involved and inherent labour difficulties in the Mackenzie reindeer operation, all products and sales situations will have to be evaluated individually to insure that they produce more revenue than the expense involved. There will be certain processing operations that will not be profitable. An example might be the cutting off and bundling of antlers from a coastal slaughter where the labour involved and the freight to market could be more than the sales price of the antlers.

In this section on reindeer products, all of the commercial products that possibly can be produced by the reindeer industry will be considered. Certainly not all of these products will be marketed, but there will be a rational combination of them offered to return optimum revenue.

The key product is reindeer meat sold by the carcass. All other meat items and byproducts require coordination with carcass sales. If at all possible, no processing operations should be undertaken that are not directly related to carcass production. Other organizations or persons should be encouraged to develop associated processing facilities which will use reindeer carcasses or reindeer byproducts as raw materials.

A breakdown of the products that can be produced by the reindeer operations is given in Table 1. The product components by weight are given in Table 2 and the percentage composition of reindeer meat and byproducts are given in Table 3.

Table 1

Products from Reindeer Operations

REINDEER -male, female -fawn, adult			
Dressed Meat	Edible Byproducts	Non-Edible Byproducts	Live Sales
-Carcasses	-Heads	-Skins-fur on	-New herds
-Sides	-Tongues	-Skins-fur off	-Research
-Halves	-Legs	-Leg Skins	-Zoos
-Quarters	-Hearts	-Antler Sets	-Promotions
-Boneless Meat	-Livers	-Carving Antlers	
-Special Cuts	-Kidneys	-Antlers in Velvet	
-Dried Meat		-Hooves	
-Processed Meat		-Offal	



Table 2

Reindeer components By Weight

<u>Component</u>	<u>Average Adult</u>	<u>%</u>	<u>Average Fawn</u>	<u>%</u>
Dressed Carcass	125 lb	56	70 lb	58
Head	12	5½	7	6
Legs (complete)	18	8	12	10
Skins	10	4	6	5
Antlers	5	2	1	1
Offal	<u>55</u>	<u>24½</u>	<u>24</u>	<u>20</u>
TOTALS	225 lb	100%	120 lb	100%

Data from Inuvik Research Laboratory

Table 3

Composition of Reindeer Meat and Byproducts

<u>Component</u>	<u>% Waste</u>	<u>% Dry Mat.</u>	<u>% Protein</u>	<u>% Fat</u>	<u>% Ash</u>	<u>Iron mg/ 100 g</u>
Back Meat	38.0	28.0	21.9	4.2	1.1	6.4
Shoulder Meat	35.0	25.9	21.7	2.5	1.1	4.5
Hind Quarter Meat	22.1	27.0	22.2	3.1	1.1	6.7
Neck Meat	41.1	28.0	21.4	5.3	1.0	3.6
Kidney	5.3	20.8	15.5	1.9	1.2	5.4
Liver	5.7	29.9	21.4	3.3	1.5	14.4
Lung	5.7	10.9	9.2	-	0.4	7.0
Heart	11.1	26.8	18.7	6.9	1.0	6.9
Tongue	21.2	44.9	12.5	30.8	0.7	3.0
Bone Marrow	-	33.7	8.9	-	1.7	3.0

Norsk Tamreindrift, Ingr. Brudeli, p. 196 and 201

## Dressed Meat

Carcasses - As in the beef cattle industry, the main sales effort of the reindeer operations centre on meat sales by the carcass. The emphasis should be on large volume quantities to jobbers, wholesalers, stores, and institutions. Since the operations are dependent on a single product line, an extensive sales marketing and distribution system is difficult to justify. Accordingly, sales to small customers and individuals should be discouraged both to support the wholesale customers and to minimize sales and distribution expense which, if not controlled, could have an adverse price effect on all customers both large and small.

The basic reindeer carcass must be handled in the best manner to suit customer and shipping requirements. As the market demands the operations should be prepared to offer whole carcasses, sides, quarters, and "streamline" whole or part carcasses with the neck and lower legs cut off.

It is a relatively simple process to cut the carcass into major sections with a power saw during the slaughter operation. The sections are easier to handle and store for both the reindeer operations and the customer. Relative to whole carcasses, the storage space for sides is around one third less and for quarters it is around one half. For expensive airplane hauling and freezing capacity, this saving in storage space is a very important factor. The main disadvantage of cutting the carcass into sections is one of inventory as there are more pieces to count, and for quarters, there are both fronts and hinds. Also there is a difference in value per pound between fronts and hinds which must be considered. Without a price difference of around 15¢ a pound between fronts and hinds, there would be a surplus of fronts (see Table 5) giving wholesale prices in Alaska).

Some customers want whole carcasses so that they can make use of all parts as they did in the "good old days" when sinew and bones were utilized. However, these "good old customers" are relatively few and might only be looked after when additional expense is not involved. An example would be a field slaughter around Tuktoyaktuk where the carcasses are sold direct to the individuals. There is also a preference amongst some people for meat that is slaughtered so as to retain much of the blood. However, this market is difficult to suit relative to the general market which prefers well-bled meat as with beef.



Streamline carcasses have a sales appeal to the wholesale customers since the parts with the lowest retail value are eliminated and shipping costs are reduced. These streamline carcasses also have the advantage of being wrapped easier and packing better for shipment. Most of the beef marketed in the Provinces has had the streamlining treatment.

Boneless Meat - Prime parts of the reindeer with the bones removed have a certain market amongst customers who want to save on freight costs or who do not want to be bothered with the bones in the kitchen. With the high freight rates to the North, there is considerable boneless meat brought in from the Provinces. To meet this competition and to provide an attractive product for the Provinces, boneless reindeer meat should be offered when opportune.

Boneless reindeer meat has been successfully sold in Alaska from the Nunivak Island operation for their sales to distant markets. Their boneless meat is packed in sixty to eighty pound plastic-lined cardboard cartons and frozen for shipment. There are possibilities of packing boneless meat in cans as in Alaska. One ton of beef carcasses requires 106 cubic feet of storage. If boned the same amount of meat requires only 80 cubic feet (Ziegler 1964: 91).

Special Cuts - There is a considerable demand for special cuts of reindeer meat from stores, restaurants and camp caterers who are accustomed to buying beef and other meats in neatly packaged preportioned units. They are willing to pay a higher price for the convenience.

Reindeer steaks and reindeer roasts could be cut from select animals at a slaughter. The market for these special cuts is probably small, but could be very profitable if a buyer is found for the 'non-special' cuts which remain. The special cuts also have a merchandising value as they would likely be served in restaurants and would condition customers to reindeer. Also stores would be interested in purchasing precut meats for direct sales to their customers.

When these special cuts are offered a separate cutting and packaging operation would have to be added at the slaughter. As this operation is extra to the basic preparation of carcasses and some capital investment would be required, it should not be started up until the basic carcass sales are well organized and there is a surplus of meat over the

demand for meat by the carcass.

However, as special cuts are offered by all packers in the Provinces and as they do offer savings in freight, inventory control, and storage space to the customer, there should be plans made for getting into this business in the future.

Figure 3 is a chart of reindeer meat cuts and shows the possible utilization of these cuts.

Dried Meat - Since dried meat and fish are staple food items among local people in the North, there is a market for dried reindeer meat. The meat at a slaughter can be dried by simple exposure of cut strips to warm air or by more elaborate drying houses which are heated. Dried meat has a distinctive taste and has the advantage of being light in weight for transportation.

Reindeer meat contains approximately 73% fluids and when dried weighs only around one-third of its original weight. To realize the same income per pound of fresh meat at 40¢/lb, dried reindeer meat would have to sell for \$1.20/lb plus an allowance for processing.

The drying process is relatively simple and if there were a market at satisfactory prices, the drying operation could be readily set up. Possibly second quality carcasses could be utilized for dried meat.

In Alaska, reindeer "jerky", a novelty dried meat, is sold at confectionery counters and in taverns. A half ounce piece attractively packaged is sold for 25¢.

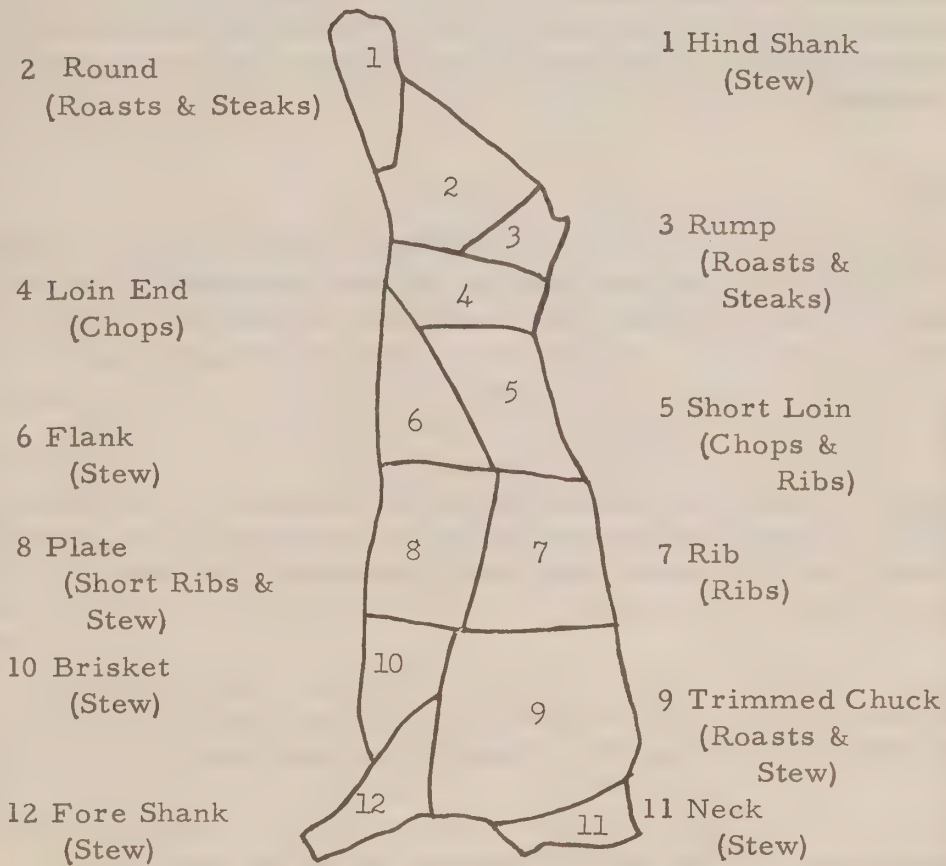
There are many variations on smoking the dried meat which make an attractive product for the specialty market.

Processed Meat - Reindeer bologna, reindeer sausage, reindeer burgers, and canned reindeer meats can be processed and offered for sale. Each of these products would require some capital investment and involve additional merchandising and management.

Reindeer bologna and sausage has been introduced in Alaska and has met with some success as a novelty product.

Figure 3

Chart of Reindeer Meat Cuts with Suggested Uses





Reindeer burger meat can be simply processed in a grinder and offers a sales outlet for scraps from the special cut business. Reindeer burger meat has been offered in stores and has been well received.

Canned reindeer meat would require a considerable investment which could only be justified if a large and proven market was found for the products. In Scandinavia and Russia a large portion of the reindeer meat is canned for simplicity of storage and shipment. Canned reindeer meat from Scandinavia is sold in Ontario. A reindeer meatball cannery has been established in Sweden (Scotter 1965). Canned reindeer meat from China is sold in Switzerland. A small cannery in Alaska produces some canned reindeer meat.

### Edible Byproducts

Heads - From the beginning of the Mackenzie reindeer operations to the present reindeer heads have been eagerly sought after. They are sold at the slaughter with only the antlers removed. They are boiled and the meat parts picked off. Under the Federal Meat Inspection regulations it is not possible to sell heads with the fur on, or the tongues still in.

Tongues - Reindeer tongues are a rare delicacy in the North. The tongues are boiled and served either hot or cold. Even at the present price of \$1.50 a pound for the tongues, they are literally sold before they are out of the reindeer's mouth.

Legs - Reindeer legs have been sold as they come from the slaughter with bones, leg meat, and hooves. The leg skins which have short tough hairs are highly valued for making mukluks and fur articles.

Hearts, Livers and Kidneys - The reindeer organs are high quality products which are readily marketed at the same price per pound as the reindeer meat.

### Nonedible Byproducts

Skins - Reindeer skins have an important place in the economy of the reindeer operations. A quality summer skin from a fawn could sell for as much as 50% of the value of the meat from the same fawn. There is an interesting possibility of developing a distinctive fur style with fawn skins as has been done in Sweden. Fawn skins are taken in their prime around the first of August.

Reindeer skins with the fur on are used extensively in the North for clothing and for bedding. The skins taken in the summer are of the highest quality as the hairs are shorter and have less tendency to shed. Also any holes caused by warble flies are at a minimum in the summer time. Skins taken in the winter are much coarser and are usually used only for bedding.

Reindeer skins with the fur off and processed into suede have great value for making clothing. As there have been no processing facilities for removing the hair in the Mackenzie Delta there has been no commercial sale of skins with the hair off. However, with the opening of a tannery in Aklavik this situation should change. There have been several inquiries from Europe for the purchase of reindeer skins with the hair off.

Leg skins with their short tough hairs have a value for making footwear and novelties. Usually these are sold with the entire leg at the time of slaughter. However, there is a possibility that the leg skins could be profitably taken from the legs and marketed as a separate item. (See Utsi 1957a).

It is expected that with the opening of a tannery in Aklavik in 1966 that the sale of and price received for reindeer skins will be greatly increased. Presently it costs around \$12.00 plus freight charges to have an adult reindeer skin tanned in Edmonton. At the Aklavik tannery this cost should be cut at least in half. For the smaller fawn skins a tannery charge of around \$1.00 can be expected at the Aklavik tannery.

With reindeer the molting of hair takes place yearly and lasts a long time. Unless special precautions are taken a reindeer skin will shed hairs. However, the most durable furs are those of the fawn.

Reindeer skins for commercial purposes are usually classed according to the age of the reindeer. "Fawn" skins are those from the age of newborn to six months. "Young" skins are those from ages six months to one year. "Adult" skins are from any older skins. Usually only the extremities of the adult skins are used for commercial purposes.

Antlers and Hooves - Reindeer antlers are another valuable item. The reindeer has the advantage over other members of the deer family in that both the male and female animals produce antlers every year. The antlers are a well known characteristic of the reindeer and can be utilized in the promotion of reindeer products in general.

Reindeer antlers are distinctive in that every antler is different from every other one. Antler sets or trophy antlers have a limited market to tourists and novelty stores. They come in all sizes. Smaller ones can be readily adapted as gun racks or as hat hooks.

The reindeer antlers are hard and strong. They are ideal for carving into decorative objects and jewellery or into knife handles. The success of the antler carvings from Baker Lake indicate that there will continue to be a large market for reindeer antlers. In recent years all of the available antlers from reindeer slaughters have been readily sold.

Reindeer antlers in velvet have a specialized market in Oriental countries where they are reputed to contain medicinal properties. To date there have been no sales from the Mackenzie Reindeer Operations to this market, but there have been several inquiries. The main problem appears to be handling of the antlers in a way that would be suitable to the Oriental customers.

Reindeer hooves have a limited market for use in the handicraft industry. A few sales have been made, but this market is essentially undeveloped. There is a possibility that reindeer hooves could be sold to the packing house industry in the Provinces for special processing into items such as glue.

Offal - Reindeer viscera is obtained at the time of slaughter in considerable quantities and could be developed into an income producing product. Presently much of the offal is cooked for dog food at the slaughter camps. For every one hundred reindeer slaughtered there is around 5,700 pounds of offal produced. This large quantity of product could be turned into several saleable products. It is noteworthy that a packing house in the Provinces has offered to purchase all of the offal from reindeer slaughters.

The most promising use for the offal is that of animal feed after it has been cooked and reduced. Experimental tests have been made on reduced reindeer offal and it was found to be a superior animal food supplement with an amazingly high protein content of 45% (see Table 4). This product is very valuable for feeding dogs and for use in fur farms. A pilot plant operation on reducing reindeer offal will be in operation at Atkinson Point during the summer of 1966.



Table 4

Analysis of Reduced Reindeer Offal

<u>Component</u>	<u>Reduced Reindeer Offal</u>	<u>Commercial Dog Food</u>
Protein	45.4 %	28.8 %
Fat	23.6	4.7
Ash	10.2	10.8
Calcium	1.7	2.6
Calories/kg	6637	4551

Report from Canada Department of Agriculture, Central  
Experimental Farm, 28 April 1965

Fat from reindeer has a high stearic acid content which makes it suitable for the production of high grade soaps and candles. However, there is little market seen for the fat in these uses and it will be left as part of the offal for processing into feeds.

### Live Sales

The sale of live reindeer by the Mackenzie reindeer operations has not been developed although there have been several transfers of live reindeer which, in the economic sense, could be considered as sales. Where the operations were initially set up to provide stock for new Eskimo herders, the whole operation was at that time justified by "live sales".

The Mackenzie reindeer operations can still serve this initial function of providing stock for new reindeer herds which could be formed anywhere in the Canadian North. With the problems of dwindling caribou herds in several areas reindeer could be introduced into these areas to build up the animal population. They could be either herded or left wild depending on the situation. With the shortage of caribou resources in many parts of the Northwest Territories, reindeer herds could be introduced and these could be controlled on an enlightened game management basis.

The Quebec government has recently made a study on the introduction of reindeer in Nouveau Quebec (Time, 11 March 1966, p 12). If this program is developed, it could be an outlet for some live sales from the Mackenzie reindeer operations.

As the reindeer is an interesting animal living in Arctic regions, it has considerable value for research on many physiological problems. For these projects live animals are required. Since the reindeer are identical to the wild caribou, many of the caribou studies can be carried out on reindeer.

There is also a market for live reindeer to zoos. The reindeer is an exotic animal from the Arctic which can under proper conditions adapt to another climate as found in a zoo. The reindeer's great popularity for pulling Santa Claus's sleigh puts it in great demand for display.

There is also a market for live reindeer to be used in promotions which involve a Christmas theme and Santa Claus. This situation involves providing relatively tame reindeer which are adapted to a factory feed diet. One organization in Oregon has a thriving business supplying reindeer to Santa Claus promotions.

## II MARKET FOR REINDEER PRODUCTS

- Early Market
- Pricing
  - a) General
  - b) Liveweight Sales
  - c) Abattoir Sales
  - d) Wholesale Sales
  - e) Retail Sales
- Market Areas
- Sales Potential
  - a) Present
  - b) Future
- Marketing Program



## CHAPTER 11

### MARKET

#### Early Markets

In the early periods of the Mackenzie reindeer operations little concern was given to the marketing of meat as the main emphasis of the project was on the building up of the reindeer herd and providing original stock for native herding units.

Virtually all of the sales were shipped to the Aklavik market until 1950. Sales of reindeer meat from the first slaughter in 1936 amounted to only \$612.55. In the early period much of the slaughter production was donated to the mission schools and hospitals at Aklavik.

In 1951 a meeting called by the Deputy Minister of Resources and Development decided that the sales of reindeer meat would be organized with wholesale prices to large purchasers and a fixed retail markup. This meeting also decided that the donations to the missions would be discontinued in the future (Resources 1952: 72).

Generally, only one slaughter was held each year. It was held in the fall when the weather was cool to preserve the meat, but before freeze up so that it could be transported to Aklavik by boat. During the first ten years of operation a total of only \$27,712 worth of reindeer products were sold.

The sales of reindeer products has varied greatly from year to year as shown in Figure 4. There is a general trend of increased sales, but the sales volume for each year seem to be dependent on the particular arrangements for that year.

#### Pricing

##### (a) General

The price obtained for reindeer products in the marketplace is an important factor in the success of the enterprise. There are numerous factors influencing a particular price. In this section a general review of these factors and the probable prices will be given with the full understanding that specific prices will be set

Figure 4  
Revenue from Reindeer Product Sales 1936-1964

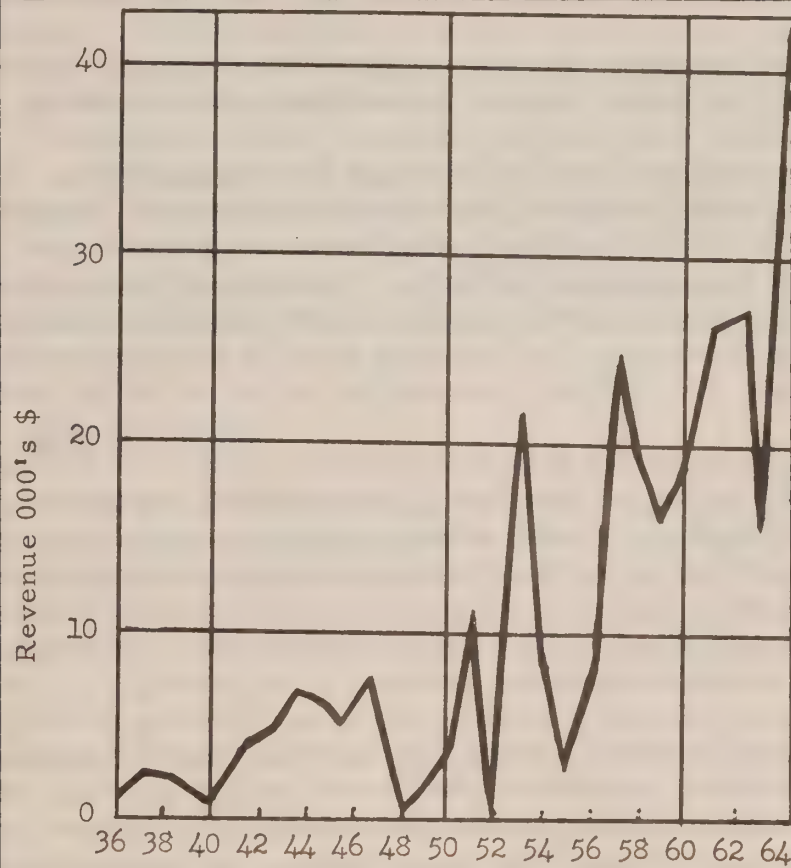
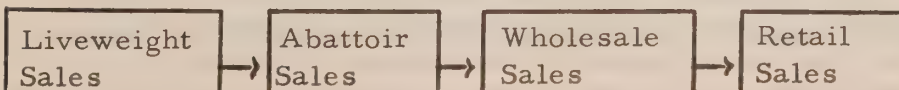


Figure 5

Marketing Process for Reindeer Carcasses



for particular products at appropriate times with cognizance of the prevailing business situation.

In the early phases of the Mackenzie reindeer operations the pricing was simple with meat being sold only by the carcass at a flat price of \$25.00 for an adult and \$15.00 for a fawn. Presently the base price of reindeer meat at the wholesale level is 40¢ per pound. This price generates around \$50.00 for an adult reindeer and \$28.00 for a fawn.

It is assumed that the main competition for reindeer meat in all markets will be beef. Most of the people in the marketing areas where reindeer meat will be sold have been brought up on beef and have an ingrained and subconscious preference for it. There are many people in the North who are more accustomed to reindeer meat or caribou but these people are rapidly becoming fewer as Southern 'culture' expands into the North. Because of this built-in preference for beef products among present and potential customers, it is likely that the base price for reindeer meat in any market will have to be less than that of beef if substantial sales are to be realized.

The merchandising skill and effort that goes into selling beef products will have to be matched by the reindeer operations. This task will not be easy nor will it be inexpensive. It is noteworthy that in a recent issue of Inuvik's newspaper fronts of first quality beef, cut and wrapped, were advertised for 59¢ per pound (20 January 1966). This was only 4¢ per pound higher than the 55¢ per pound price of reindeer meat in its home market.

To remain competitive and not lose markets to beef sales, the Mackenzie reindeer operations will have to be aggressively aware of the market situation and be prepared to reduce and increase prices as dictated by the pressures of the marketplace. The pricing situation will vary for each of the marketing levels shown in Figure 5. The pricing situation will now be reviewed for each of these likely marketing channels.

#### (b) Liveweight Sales

The sale of live reindeer at the corral to a packing house operator is a remote possibility. It can be expected that the Mackenzie reindeer operations will always have to provide abattoir facilities. However, the establishment of a liveweight sales price is important as it serves to separate the herding activities from the abattoir and packing house activities. This separation permits a more realistic costing and allows a comparison with the stockyard



sale of beef cattle.

In a recent settlement with native herders for the No. 4 herd, a liveweight price of \$35 per adult and \$15 per fawn was paid. The initial stock from Alaska was purchased at \$65 a head delivered to the Mackenzie Reindeer Reserve.

The liveweight sales of beef cattle vary greatly as shown in Figure 6 which gives the average January prices for good steers in Toronto. The Edmonton prices are usually a few cents per pound lower than those in the Toronto stockyard. Recent liveweight sales prices in various stockyards are given in Table 5.

Considering that reindeer liveweight prices will be comparable to beef and that the shipping expenses to major markets will be at least 10¢ per pound, a liveweight price for reindeer of 15¢ to 20¢ per pound seems realistic. This price would give an approximate value of \$33.75 to \$45.00 for a 225 lb adult and \$18.00 to \$24.00 for a 120 lb fawn.

(c) Abattoir Sales

The pricing of products from the abattoir operation must allow for the liveweight cost plus the cost of processing and waste. Presently, all meat products are offered at 40¢ lb FOB the abattoir. This price appears satisfactory for the present operations, but will probably have to be lowered in order to sell considerable quantities in markets away from the Mackenzie Delta region. Pricing at the packing house level can be used as a promotional tool in developing new markets, increasing sales, and meeting competition.

At the packing house sales level there is the alternative of selling meat FOB the packing house or of selling the meat delivered to the customer. Since the methods of transportation and quantities shipped will always vary greatly, it is suggested that a FOB packing house base be established. With the FOB price the customer will always have the opportunity to arrange his own delivery. In an actual competitive situation it will probably be advantageous for the Mackenzie reindeer operations to cover part of the shipping costs by offering a lower rate than that of the commercial carriers.

Processing carcasses through the abattoir will probably cost around 5¢/lb when sufficient sales are made to support an efficient

Figure 6

Livestock Prices-Good Steers-January Average-Toronto

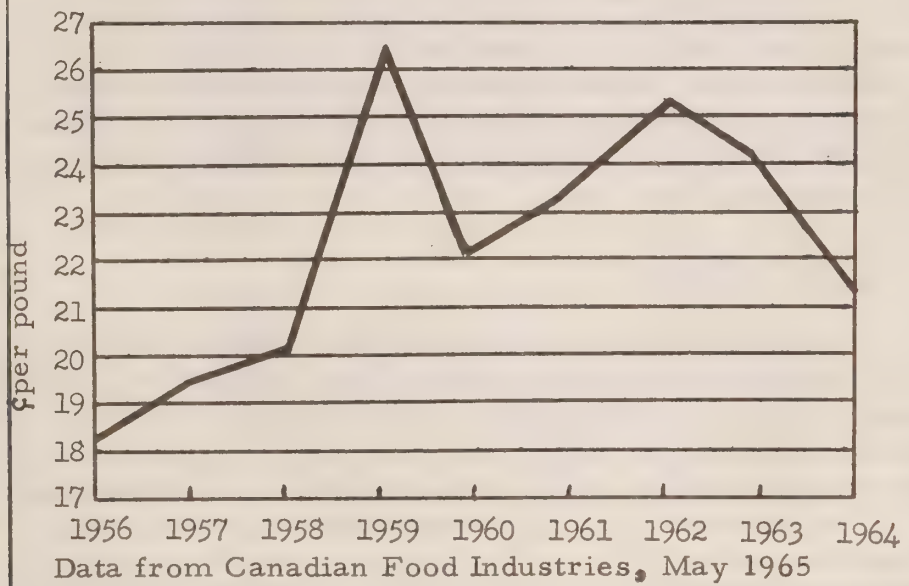


Table 5

Liveweight Sales Prices for Choice Steers  
at Various Stockyards on 3 March 1966

Toronto	\$27.00 - 28.00
Calgary	\$24.75 - 25.80
Winnipeg	\$26.00 - 27.00
Buffalo	\$27.00
Montreal	\$25.25 - 27.50
Chicago	\$27.25 - 28.25

Globe and Mail, 4 March 1966

Table 6

Reindeer Meat Wholesale Prices - Nunivak Island 1964

Half Carcasses (sides)	39¢ lb
Front Quarters	35¢ lb
Hind Quarters	47¢ lb
Boneless Meat	52¢ lb
Reindeer Hearts	35¢ lb

Data from Land Operations 1964



operation. In the most efficient packing houses in the USA this processing cost drops to as low as 2.8¢/lb (Farm Journal Inc., June 1964). However, for the Mackenzie reindeer operations with smaller volumes, less mechanization, and more complete packaging the figure of 5¢/lb seems minimal.

The FOB packing house price of meat by the carcass will probably work out to 20¢ to 25¢ per pound in the future when considerable volumes are processed. In the earlier stages a price of 30¢ to 40¢ per pound will have to be charged to keep the operations solvent.

The packing house prices for Alaskan reindeer meat in 1964 from Nunivak Island are shown in Table 6. It is expected that the Mackenzie reindeer operation prices will be lower than these as the distance to markets is greater and the retail price of competitive meat products, such as beef, is lower.

Present wholesale prices for Mackenzie reindeer products are given in Table 7.

It is reported that buffalo carcasses from the Elk Island National Park in Alberta were recently sold for 35¢/lb FOB Elk Island. Because of the great differences in shipping distance, reindeer meat would have to sell for 20-25¢/lb to compete in the same market (Globe and Mail, 22 February 1966.)

There is a possibility that fawn carcass meat should sell at a price different from that of the adult carcass meat. In the livestock market calves sell for a considerably higher price per pound than the adult cattle. At a recent sale good calves sold for \$32-36 CWT while good steers sold for \$27-28 CWT (Globe and Mail, 4 March 1966). In Sweden reindeer fawn meat is considered a delicacy and commands quite a bit higher price than for adult reindeer meat. For the Mackenzie reindeer operations fawn and adult meat is sold for the same price per pound. Because of the greatly increased production of fawn meat in the future there will probably not be the chance to increase its selling price. Should there be an overall surplus of adult and fawn reindeer meat it would probably be best to lower the price of adult meat.

In Russia one collective farm reports the sale of reindeer meat for canning at \$1.00/lb. (Soviet Union Today, April 1966, p 15). This rather high price is probably only given for choice cuts without any bone and could be equivalent to around 50¢/lb for meat sold by the carcass.

Table 7

Wholesale Prices on Reindeer Products Winter 1965/66

<u>Product -</u>	<u>Wholesale Price at Slaughter Point</u>
Adult Reindeer Carcasses	40¢ lb
Fawn Reindeer Carcasses	40¢ lb
Reindeer Tongues	\$ 1.50 lb
Reindeer Hearts, Livers, Kidneys	40¢ lb
Reindeer Heads	10¢ lb
Reindeer Antlers in Bundles	20¢ lb
Reindeer Antler Sets	\$ 1.00 lb
Reindeer Skins - Winter Frozen	\$ 2.00 each
Reindeer Skins - Winter Dried	\$ 3.00 each
Reindeer Skins - Summer Dried	\$ 6.50 each
Reindeer Legs (complete)	30¢ each
Canadian Reindeer Project	

(d) Wholesale Sales

Up to the present there have been no sales of reindeer products to wholesalers and, in effect, the packing house sales may be considered as wholesale sales.

With increased sales volumes in the future it is anticipated that a large part of the production will go to wholesalers. These wholesalers will provide distribution, customer contact, and promotion that would not be possible without considerable expense to the Mackenzie reindeer operations. The management energies of the Mackenzie reindeer operations will be better spent mainly on production rather than on a sales and distribution system.

The wholesale sales pricing can be expected to be comparable to the packing house prices plus the cost of delivery to the wholesaler. The actual prices will depend on the extent of the services such as delivery and merchandising provided by the wholesaler.

(e) Retail Sales

The retail selling price of reindeer products will depend on the wholesale cost of these products plus provision for delivery and handling. The retail price will vary greatly between Inuvik and Edmonton or Toronto.

The pricing at the packing house level must be cognizant of the retail prices so that the reindeer meat is competitive and is sold in the quantities expected.

For comparative purposes the retail prices of various reindeer meat cuts in Fairbanks is given in Table 8. In Teller, Alaska, about 60 miles north of Nome, two stores are selling reindeer meat by the quarter at 50¢/lb (Tundra Times, 5 April 1965). During the winter of 1965/66 all cuts of reindeer meat were sold by the Hudson's Bay Company in Inuvik for 55¢/lb.

Market Areas

Products from the Mackenzie reindeer operations have been sold only in the Mackenzie Delta area except for development shipments in recent years to upriver towns in the Mackenzie District and skin sales to the Eastern Arctic.



Table 8

Alaskan Reindeer Retail Meat Prices

Sirloin Steak	\$ 1.29 lb
Round Steak	\$ 1.29 lb
Round Roast	\$ 1.19 lb
Loin Chops	\$ 1.19 lb
Rib Chops	.89 lb
Rump Roast	.89 lb
Boneless Stew	.89 lb
Shoulder Chops	.79 lb
Reinburger	.79 lb
Reindeer Bologna	.69 lb
Shoulder Roast	.69 lb
Sides (cut & wrapped)	.65 lb
Stew Bits	.39 lb

Fairbanks, Alaska, March 1962

Since the total population of the Northwest Territories is increasing at a rapid rate due to natural births and immigration, the home market for reindeer products can be expected to increase correspondingly. The population growth in the Northwest Territories with estimates to 1977 is shown in Figure 7.

Although the Mackenzie Delta area will remain the prime market for reindeer sales, many other areas will have to be developed for the reindeer operations to achieve a satisfactory sales level. These areas will be described in this section under primary, secondary, and tertiary market areas. Populations for the market areas are estimated for 1967 and 1977.

Primary Market Area - The Mackenzie Delta area with a 1967 population of 5,000 will continue to be the greatest marketplace for reindeer products. Also of primary importance will be the settlements in the Slave Lake area and along the Mackenzie River. The total 1967 population of this area is estimated at 16,500 people as shown in Table 9.

Secondary Market Area - This area is the entire Northwest Territories with the exception of the areas included in the Primary Market Area. This includes all of the Eastern Arctic, remote areas of the Mackenzie and Keewatin districts such as Coppermine, Cambridge Bay, Baker Lake, Holman Island, and Sachs Harbour, and a market referred to as "special" which includes the transient population in the North working on mineral exploration and defence projects.

Tertiary Market Area - This area includes all of the Yukon, the Provinces, and the export market.

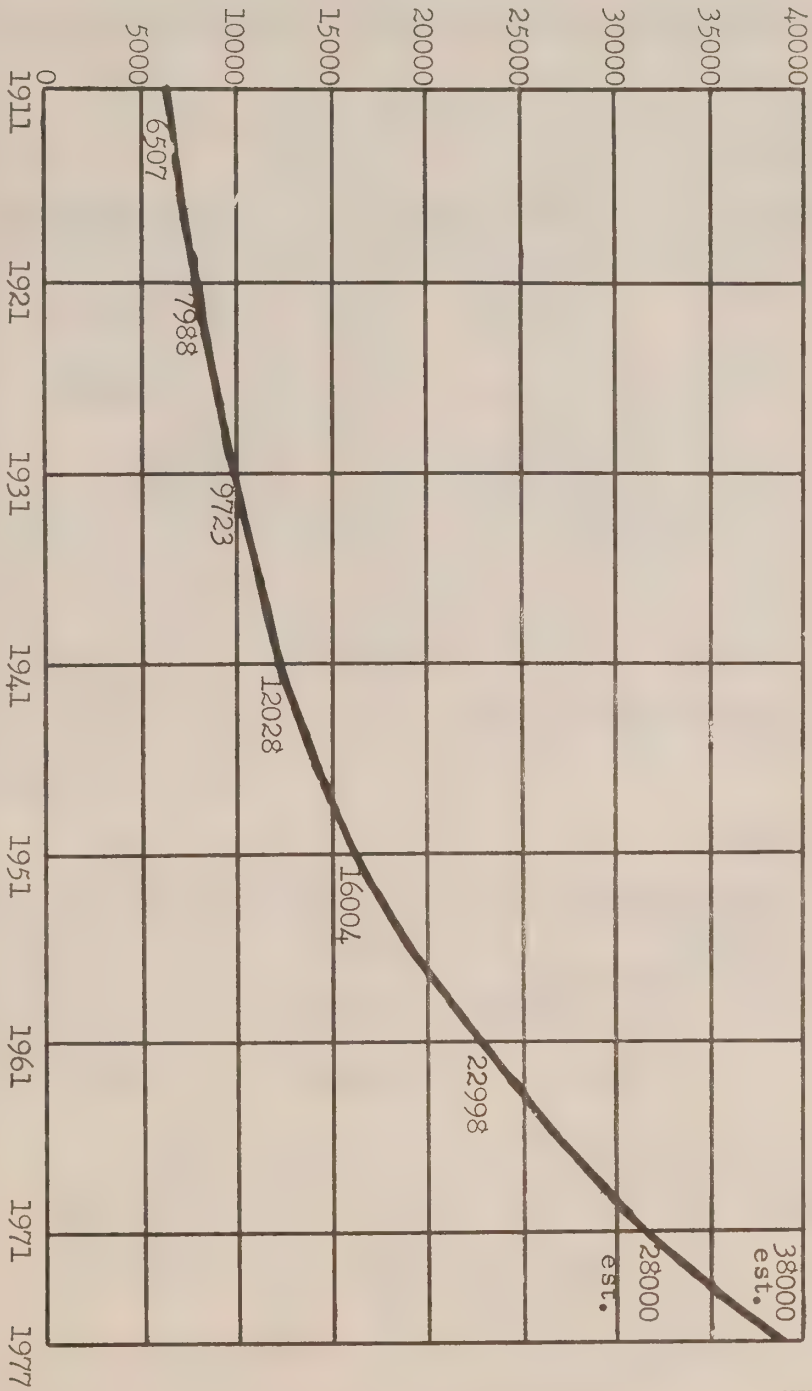
### Sales Potential

#### (a) Present

The income from the sale of reindeer products has varied greatly in past years, but has shown a general increase as shown in Figure 4 in the section on early markets.

Peak sales were reached during the fiscal year 1964-1965 when 52,000 worth of reindeer products were sold. In this period 109,000 lb of reindeer meat was marketed mainly in the Mackenzie Delta area. These sales include \$10,000 worth of meat sold by the Mackenzie reindeer operations on behalf of the No. 4 native Herd.

Figure 7  
Population of the Northwest Territories



Data from Northwest Territories Today, Dept. NA&NR, 1965



Table 9

Estimated 1967 Populations of Market Areas for Reindeer Products

Primary Market Area

<u>Mackenzie Delta</u>		<u>Slave Lake</u>		<u>Mackenzie River</u>	
Inuvik	3,000	Yellowknife	3,600	Good Hope	350
Aklavik	700	Fort Smith	2,000	Fort Norman	300
Fort McPherson	600	Hay River	2,000	Norman Wells	100
Tuktoyaktuk	500	Resolution	500	Fort Franklin	300
Arctic Red River	100	Fort Rae	600	Wrigley	150
Reindeer Station	100	Discovery	200	Simpson	600
		Providence	400	Other	200
		Other	200		
<hr/>		<hr/>		<hr/>	
TOTALS	5,000		9,500		2,000

Total All Primary Market Area 16,500

Secondary Market Area

Eastern Arctic	10,000
Special	2,500
Other Mackenzie	
Districts	<u>2,000</u>
TOTAL	14,500

Tertiary Market Area

Yukon 18,000  
Provinces 20 MM

In recent years there has been some effort made to develop sales outside the Mackenzie Delta area. A special backhaul freight rate was arranged with Pacific Western Airlines to carry reindeer meat to their main bases in the Mackenzie. Sales have been made to most of the upriver towns and to the towns in the Slave Lake area.

Recent sales efforts have been hampered by problems of supply. While increasing the herd size the number slaughtered has been minimized. Also there have been some difficulties associated with modernizing the herding and production facilities of the operations. Had there been an adequate supply of meat, the present sales volume might have reached twice its present level or approximately \$100,000 each year.

(b) Future

The potential sales volume of reindeer products is dependent on many variable such as population, market area, per capita consumption, export markets, and range of products offered. In this section these variables will be reviewed and the potential sales volume will be estimated for the year 1967 and ten years in the future to 1977. These estimates of sales volume are very important in determining the income that the operations could realize in the future. In the 1977 estimate of market potential for reindeer meat 'pessimistic' and 'optimistic' predictions are made to allow somewhat for the many unknown variables.

The potential sales of a food product can be determined effectively on the basis of per capita consumption. As beef is the main competition to reindeer meat, the per capita consumption figures for beef can be used as an indicator of the potential per capita consumption of reindeer meat for any given market. This approximation is necessary as little data is available on actual meat consumption in the anticipated market areas for reindeer meat.

A study prepared for the Economic Council of Canada indicates that there will be an increase of 20% in the total demand for agricultural products between 1963 and 1970 (Dawson, 1964). This study also reports that the annual per capita consumption of beef has increased from 58.5 lb in 1951-53 to 77.6 lb in 1961-63 (see Table 10). It is expected that the annual per capita consumption of beef will increase to 95 lb by 1980 (Globe and Mail, 19 October 1964). In 1965 the annual per capita consumption of beef was 78.7 pounds (Globe and Mail, 22 April 1966).

Table 10

Canadian Per Capita Meat Consumption

<u>Type</u>	<u>1951-53</u>	<u>1961-63</u>
Beef	58.5 lb	77.6 lb
Pork	62.9	50.1
Mutton	2.3	3.8
Other	<u>12.6</u>	<u>8.5</u>
TOTAL	136.3	140.0

Dawson 1964

Table 11

Per Capita Consumption of Reindeer Meat

<u>Market Area</u>	<u>% of Base*</u>	<u>Pounds per Capita</u>
Primary Market Area		
Mackenzie Delta	40 %	30 lb
Slave Lake	5	4
Mackenzie River	10	7.5
Secondary Market Area		
Eastern Arctic	6	4.5
Special	3	2
Other Mackenzie District	2	4
Tertiary Market Area		
Yukon Territory	4	3
Provinces	-	-
Export	-	-

\*Base is taken as per capita consumption of beef for all of Canada in 1965 being 75 pounds.



Since much of the market area for reindeer meat is away from the highly urbanized Eastern areas, it can be conservatively estimated that the present average annual per capita consumption of beef is around 75 lb for the reindeer meat market areas. Using this 75 lb per capita as a base, the probable per capita consumption of reindeer meat has been estimated for each of the market areas as shown in Table 11. The estimates range from 30 lb per capita in the Mackenzie Delta area to 2 lb per capita for the special transient market in the Northwest Territories. The validity of these estimates is supported by a recent study of the potential market for reindeer meat in Alaska in which the per capita consumptions of reindeer meat varied between 25 lb and 5 lb (Little, 1963). This information is presented in Table 12.

The highest per capita consumption for the reindeer market is in the Mackenzie Delta area. This estimate of 30 pounds per person amounts to only 40% of the beef consumption average and might even be unrealistically low. The Mackenzie Delta is the home of the reindeer operations and the residents have long been familiar with reindeer products. In the fiscal year 1964/65 with 109,000 pounds of reindeer meat sold to an estimated 4,000 population, the per capita consumption was 27 lb. During this period the meat was not available throughout the year and no particular sales efforts were made. With a larger supply of meat and some merchandising effort, the per capita sales would have been much higher in this period.

There are relatively high per capita consumptions of reindeer reported for particular markets in Alaska. Around 90,000 lb of reindeer meat a year are sold in Nome (Tundra Times, September 1964). With a population of 2,500 there is an annual per capita consumption of 36 lb of reindeer meat.

The Mackenzie Delta area is the only market with actual sales experience on reindeer meat, and in this area the sales estimates seem modest. The estimates for the other market areas will probably hold as confirmed by the Alaskan experience for other than the home markets of the reindeer operations. In these markets the potential per capita consumption is considerably lower because of the greater shipping distances or because the people will be obtaining more of their meat supply off the land as in the areas where there are caribou herds.

The sale of reindeer meat outside of the Northwest Territories will depend on many factors. However, unless reindeer meat can successfully compete with other meats in the Northwest Territories, there is little hope that substantial markets can be developed in the Yukon Territory, the Provinces, or other countries in the world. This same conclusion for Alaskan reindeer sales was arrived at by the recent survey of the Alaskan reindeer industry (Little 1963: 4).

When the expenses of freight and the high cost of selling in a complex market are considered, a lower net price can be expected for any reindeer meat sales that are exported outside of the Northwest Territories. Sales to the Provinces will be to the specialty market with a sales appeal based on high quality and tastiness. Continued sales cannot be expected if the uniqueness of reindeer meat alone is depended on.

Based on the estimated population and per capita consumption, the market potential for reindeer meat sales in 1967 and 1977 are given in Table 13. In 1967 a total potential sale of 310,500 lb is expected. In the next ten years the potential sale of reindeer is estimated to rise to 459,750 on the pessimistic side and to 1,025,000 on the optimistic side.

As the pessimistic estimate for 1977 is only five times the potential 1964/65 sales volume, this sales level could be reached over the 10 year period without an excessive strain on the operation management. The optimistic estimate for 1977 of 1,025,000 lb is ten times the present potential sales level and seems to be within reason but doubtful. A major factor between this optimistic and pessimistic estimate is the provision for increased sales to the Provinces and export market. It is proper that these sales be planned for but they should not be depended on. It is noteworthy that the recent Alaskan survey only shows a potential sale of 200,000 lb a year to the 'Lower 48' market (see Table 12).

### Marketing Program

For the Mackenzie reindeer operations to increase its annual sales from 100,000 lb to 500,000 lb or 1,000,000 lb a well planned marketing program is essential. This section will review the factors influencing this program, but will not attempt to be specific on a particular program of action as the essence of any marketing program must have enough flexibility to adjust to the demands of the market.

Table 12

Alaskan Potential Market for Reindeer Meat

<u>Area</u>	<u>Total Potential in Pounds</u>	<u>Per Capita Consumption</u>
Western Alaska	425,000	25
Northern Alaska	25,000	5
Anchorage-Fairbanks	570,000	5
Export to Lower 48	<u>200,000</u>	-
TOTAL	1,220,000	

Little, 1963: 26

Table 13

Market Potential for Reindeer Meat in 1967 and 1977

	1967 Market Potential			1977 Market Potential		
	Pop.	per Cap lb.	Market Potential lb.	"Pessimistic" per Cap lb.	Market Potential lb.	"Optimistic" per Cap lb.
<u>Primary</u>						
Mac Delta	5,000	30	150,000	30	210,000	40
Slave Lake	9,500	4	38,000	4	60,000	10
Mac River	2,000	7.5	15,000	7.5	18,750	10
Total	16,500		203,000		288,750	
<u>Secondary</u>						
East Arctic	10,000	4.5	40,500	4.5	54,000	10
Special	2,500	2	5,000	2	6,000	5
Other Mac	2,000	4	8,000	4	10,000	10
Total	14,500		53,500		70,000	
<u>Tertiary</u>						
Yukon	18,000	3	54,000	3	66,000	5
Provinces	20 MM	-	-	-	25,000	-
Export	-	-	-	-	10,000	-
Total			54,000		101,000	
Total All Areas			310,500		459,750	
						1,025,000



The basic program will require an awareness of the market dynamics involving changes at the consumer level, technological innovations, changes in production methods, influences from government regulations, and the general level of economic activity. At the consumer level there might be a distinct swing towards buying meat prepackaged rather than from a butcher. There might be a radical development in technology that would permit the shipping of unrefrigerated meats that had been exposed to atomic radiation. At the production level advances in freeze drying techniques might eliminate the need for freezer storage. A new government regulation might insist on more expensive handling methods. A general depression might decrease the demand for red meats. There will always be changes in the marketplace and a management 'skill' will have to be developed to provide a stable supply of high quality product suitable to the market demands.

Although a specific sales responsibility does not need to be detailed, a definite part of the operation management will have to be directed towards sales development. Because the Mackenzie reindeer operations are handling only one basic product and not a broad line of products, the support of an extensive sales organization is not required. It will be more efficient to sell in large quantities to wholesalers who will utilize their staff and contacts to provide the necessary promotion, service, and customer relations.

The wholesalers handling reindeer meat should not be in competition with other wholesalers in any one market. There is the possibility that the entire sales responsibility at the wholesale level could be handled by one of the major meat packers. This arrangement would be particularly advantageous for sales in the Provinces.

For reindeer meat sales within the Northwest Territories a combination of abattoir sales and wholesaler sales would suit the market. Particular attention has to be paid to this market as it is the economic basis of the Mackenzie reindeer operations. In this market the present sale is mainly to local Northern people. As acculturation proceeds and Southern merchandising moves in, a fundamental change in diet can be expected. The marketing program in the Northwest Territories must take cognizance of these changes and satisfy any new desires with reindeer meat. Imported and processed meats supported by commercial pressures will be more available. The trend towards high quality packaged meats which is now popular in Southern supermarkets can be expected soon in the North. This trend must be met by the reindeer operations high standards of quality and handling and with effective merchandising.

Reindeer's share of the market in the future will depend on consumer preference as influenced by price, availability, choice of cuts, and merchandising. With these factors in mind the Mackenzie reindeer operations will have to develop a marketing strategy that will create a continuing demand for reindeer meat among present customers and bring in new customers.

The competition amongst food products will be very keen in the future. The price for meat products could drop in relation to other foods. The Economic Council of Canada report of future agriculture changes states that "the application of all scientific principles of breeding, feeding and management as well as disease control could double the livestock production using the same amount of feed as at present" (Dawson, 1964). To survive, the Mackenzie reindeer operations must be a leader with respect to production, handling, and sales.

Public relations will be an important factor in the future marketing program. Reindeer and reindeer products should be kept in the "public eye" whenever the opportunity arises. Events giving people the opportunity to see reindeer under pleasant conditions, such as the popular "Reindeer Days" at Inuvik, should be continued. The reindeer herd should be featured as a tourist attraction of the Mackenzie Delta area with reindeer products readily available to them.

Government officials and nutritionists have long lamented over the problems of a high carbohydrate diet among the local Northern people. The encouragement of reindeer meat consumption amongst these peoples will serve as a readily acceptable source of protein that can be provided at economical levels.

### III RANGE MANAGEMENT

- Introduction
- Range Physiography
- Reindeer Forage
- Grazing Capacity
- Optimum Utilization

## CHAPTER III

### RANGE MANAGEMENT

#### Introduction

Range management involves the optimum utilization of the Reindeer Grazing Reserve with consideration for:

- 1) Obtaining full utilization of the available forage on a continuing basis.
- 2) Provision for the prevention of over utilization of any part of the Reserve.
- 3) Protection of the Reserve from damage from natural and human causes.
- 4) Effective knowledge of the forage capacity of all parts of the Reserve for the planning of grazing programs.

The material in this section will review the factors involved in range management.

On the initial range study which led to setting up the Mackenzie Reindeer Grazing Reserve, A.E. Porsild in 1929 reported that the range was eminently suitable for the development of a reindeer industry with respect to vegetation, climate, and topography (Porsild 1929). This situation remains true today as the range appears to offer excellent possibilities for the continuation and expansion of the reindeer operations.

The initial reindeer range set up in 1933 was made up of 6,600 square miles (Government of Canada, PC 2554 of 14 December 1933). This range was increased to 18,000 square miles in 1952 (Government of Canada, PC 1188 of 29 February 1952).

In brief, the reindeer graze on green grasses most of the summer, browse on willows and shrubs in the autumn, and in the winter feed mainly on lichens. Range management involves the optimum utilization of these forage resources.

#### Range Physiography

The Mackenzie Reindeer Grazing Reserve is a rather large



area. Its vastness is shown by comparing it with other known areas in Table 14. The Reserve is roughly 150 miles from east to west and 120 miles from north to south.

In this great area there are considerable differences in topography, vegetation, and climate. The Reserve is made up of three range types. The first is the Arctic tundra zone in the Northern section of the Reserve. This zone is characterized by the absence of both relief and trees. The forage components are made up of low grasses, sedges, herbacious plants, and dwarf shrubs. There are relatively lush grass forage areas along the coast. This range serves well for the summer pastures of the reindeer.

The second range type is the sparse taiga forest area located on higher land in the Northern section of the Reserve. In this area there is a heavy lichen 'carpet of reindeer moss' spread amongst small spruce trees with an average height of only 20 feet. This area serves as the winter pasture of the reindeer.

The third range type is located between the first and second types. It is a transition between the coastal grassy area and the Southern taiga. A.E. Porsild refers to this area as "upland tundra" (Porsild 1947). The zone is characterized by rolling low hills varying in height from 500 feet on the west to around 200 feet in the east. The drainage system of this upland area consists of meandering creeks and small rivers. In sheltered places and along the river and creek banks there are dense thickets of alder and willow. On the rest of the area the vegetation is made up of sedges, dwarf shrubs, mosses, and lichens. This area serves as the spring and autumn pastures for the reindeer.

The Mackenzie Reindeer Reserve has an advantage over most other areas in the Northwest Territories suitable for reindeer grazing in that there is little danger of mixing with caribou. The Mackenzie Delta on the west serves as an effective barrier from the caribou herds in the Richardson Mountains which travel North as far as the Yukon Coast. There are relatively few caribou to the East of the Reserve and these traditionally move from the Colville Lake area up to the Liverpool Bay area and more Easterly points. Some of this caribou herd often passes through the Northwest corner of the Reserve along the valley of the Anderson River.

Climatologically the Mackenzie Reindeer Reserve is an arctic desert. The Inuvik weather records show an average precipitation of only 9.75 inches per year with a range between 2.75 inches and 13.75 inches. Much of the precipitation falls as snow

Table 14

Size Comparison of Mackenzie Reindeer Reserve with Other  
Known Areas

Area of Mackenzie Reindeer Reserve	18,000 sq mi
Areas Smaller Than Reserve: Prince Edward Island	2,000 sq mi
Lake Ontario	7,300 "
Massachusetts	9,300 "
Netherlands	12,900 "
Switzerland	15,900 "
Denmark	16,900 "
Areas Larger Than Reserves: Nova Scotia	21,400 "
Lake Huron	23,900 "
Ireland	26,600 "
New Brunswick	28,300 "
Austria	32,400 "
Island of Newfoundland	42,700 "

of which there is an average annual fall of 59.25 inches. The snowfall ranges between 18.22 inches and 76.9 inches.

The average annual temperature at Inuvik is 10.5<sup>o</sup> F. The January mean minimum temperature is -31.1<sup>o</sup> F and the July mean maximum temperature is 65.9<sup>o</sup> F. The maximum recorded temperature at Inuvik is 88.5<sup>o</sup> F and the minimum was -62.0<sup>o</sup> F. The mean annual windspeed is 6.2 miles per hour.

### Reindeer Forage

In the summer reindeer feed on a great variety of forage plants such as grasses, sedges, weeds, and other herbaceous and shrubby vegetation. In the winter they feed mainly on lichens such as Cladonia alpestris, Cladonia rangiferina and Cetraria icelandica.

The summer forage consists of higher order plants that are firmly rooted, readily reproduce, and grow rapidly. This forage produces a substantial annual foliage which is available for reindeer browsing. The winter lichen forage is made up of lower order plants that are lightly anchored, have a delicate structure, reproduce only vegetatively, and grow very slowly. In the hot summer weather the lichens become so dry and brittle that they are easily destroyed by trampling and are highly inflammable.

The lichens on the reindeer range are of the greatest importance as they represent easily accessible carbohydrate nourishment when other fodder is not available. The lichen's protein content is very low, but the reindeer can thrive on lichen along through the winter if they are well fed and healthy through the previous summer. Mosses are not considered palatable by the reindeer although they will eat them unawares with other food (Ahti 1959).

The reindeer readily detect lichens through as much as four feet of snow and they use their paws to dig down to them. In the taiga forest sections of the Reserve the snow remains soft throughout the winter and is ideal for lichen browsing. In the upland tundra section of the Reserve, where the reindeer graze in the spring and autumn, there are many areas which are windswept and relatively free of snow. In the spring the sun melts off the snowcover on southward facing slopes and makes the forage accessible to the reindeer.

Winter forage lichens, at their best, are not balanced fodder for the reindeer. They are mainly carbohydrate with little protein, vitamin, or mineral. Should there be an exceptionally bad winter with heavy snow and ice cover on the forage or if the herd is grazing in an over utilized range, then malnutrition can become an acute problem. Even under favourable winter conditions the reindeer will lose all of its fat stored up from the previous summer and it will be lighter in weight by spring.

During a severe winter the reindeer can be expected to eat lichen growing on the trees as G.W. Scotter has reported for the caribou in Northern Saskatchewan (Scotter 1962).

During a hard winter and when there are signs of malnutrition, the reindeer could be fed special fodder concentrates. These concentrates have been used to a limited extent in Scandinavia, but their high cost and difficulty in getting it to the reindeer will limit its application for the Mackenzie reindeer operations.

Besides lichens, reindeer in the winter feed on branches and buds of dwarf birch, shoots of alder, various species of arctic bushes and dry sedge (Flerov 1952: 232). Later in the spring they eat leaves and berries as available.

In the summer the reindeer feed mainly on grasses and semi-bushy plants, leaves of willow and various sedges. Experience on the summer range indicates that the grasses and sedges stand up extremely well under heavy grazing. In some areas the fodder cover has actually increased due to the 'tilling' effect of the reindeer hooves (Porsild 1947).

Commenting on the taiga forest area between Sitidgi and Campbell Lakes, A.E. Porsild wrote "This country is one A reindeer country for winter range. As a whole about 9/10 of the land has 100% forage value" (Porsild 1929: 87).

In the tundra lichen area the reindeer range is quick to react to any disturbance. The length of time required for recovery is directly proportional to the degree of disturbance. An overgrazed section of the lichen range would require at least ten years to recover (Palmer 1945). In many cases trampling causes more damage than grazing. Moderate grazing with open herding methods and rotational use of grazing areas will permit continuing utilization of an undamaged tundra range.



Only in the summer do the reindeer receive a balanced diet. For the rest of the year the range is deficient and the reindeer have to draw on body reserves. Because of the relatively short summer period it is most important that the reindeer herds have adequate foraging areas in the summer and that they are not disturbed. If a reindeer does not build up its body condition during the summer, it is not likely to survive the following winter. Table 15 gives the nutritional balance for the pastures throughout the year and shows the importance of the summer fodder.

### Grazing Capacity

On the initial survey for the Mackenzie reindeer operations, A.E. Porsild reported that the grazing capacity of the Arctic coast between the Alaskan border and Cape Parry (350 miles) was 250,000 reindeer and that each reindeer required 40 acres of grazing land (Porsild 1929). As the present Mackenzie Reindeer Reserve takes up around one third of this coastal area, this estimate would give the Reserve a grazing capacity of around 85,000 reindeer.

An aerial survey of the Reserve in 1935 reported a grazing capacity of 50,000 reindeer (Clarke 1942: 7). When A.E. Porsild visited the Reserve in 1947 he examined the range and reconfirmed his earlier estimates on the carrying capacity of the range at 40 to 60 acres per animal (Porsild 1947: 14).

Recently S.B. Johansson has estimated that the Reserve would carry around 30,000 reindeer (Johansson 1965).

These various estimates are shown together in Table 16 along with estimates for other ranges and the number of reindeer per square mile of range. Another estimate of the Reserve carrying capacity will shortly be available from the Canadian Wildlife Service.

Because of the many possible variations in herding patterns, weather conditions, and the unknowns of reindeer browsing, it is very difficult to make accurate estimates of reindeer grazing capacity. With a more complete knowledge of the available forage on the Reserve it will be possible to improve the predictions for the various ranges on the Reserve. For the present it is planned to increase the herd size to a level which the Reserve will adequately support on a continuing basis. This optimum utilization of the Reserve will be ascertained by keeping a close watch on the ranges for over utilization and on the body condition of the reindeer for signs of slow growth rates or malnutrition.

Table 15

Nutritive Balance on Seasonal Pastures

Pasture	Average Nitrogen	Daily Fodder in Grams Calcium	Balance Phosphorus	Change in Liveweight grams/day
Winter Lichens Only	-6.17	-1.02	-1.15	-136
Spring Lichen 300 gm grass	-4.61	+0.72	+2.73	- 22
Summer Green Grass & Sedge +10.48		+0.84	+0.77	+278
Fall Green Fodder Lichen	-0.62	+0.89	+1.48	+161

Druri and Mitushev 1965

Table 16

Reindeer Range Survey - Comparison of Ranges

<u>Reindeer Range</u>	<u>Number of Reindeer</u>	<u>Area Sq Mi</u>	<u>Reindeer per Sq Mi</u>
Mackenzie			
(Johansson 1964) est max	30,000	17,900	1.7
(Porsild 1929 and 1947)	85,000	-	16
(Porsild 1929) Summer Range			70-80
St Matthew Island, Alaska			
(Klein 1964) for 1957			10.5
for 1963			46.9
All Alaska Ranges			
(Palmer 1929)			10-16
Alaska Summer Range			
(Palmer 1929)			70-80
Karesuando, Sweden	40,000	6,700	6
Norrkaitum, Sweden	12,000	2,000	6
Sirkas, Sweden	15,500	2,150	7.2
Mellanbyn, Sweden	7,000	1,150	6.1
Nordland, Norway	24,400	3,200	7.6

Whenever the available grazing areas show signs of over utilization and tests on the reindeer body condition show a decline, the herd size will be held steady or will be reduced.

A herd of 30,000 reindeer on the Mackenzie Reindeer Reserve appears to be well within the grazing capacity of the ranges. The estimate seems pessimistic as it gives a much lower number of reindeer per square mile of range than for other estimates of the Reserve and ranges in other countries as shown in Table 16.

Control of range over utilization is very important. The Alaskan reindeer population crash of the 1930's was attributed mainly to range depletion (Hanson 1952). Fawn mortality for white tailed deer has reached 25% to 50% on a depleted southern range and the same could be expected on the Mackenzie Reindeer Reserve (Quick 1962).

#### Optimum Utilization

The optimum utilization of the Mackenzie Reindeer Reserve for reindeer depends on a full knowledge of the available fodder and the reindeer browsing habits. There have been several botanical studies made on the Reserve which provide a basis for determining ranges and their available fodder. Only practical knowledge of the Mackenzie reindeer browsing habits is available to correlate browsing with the available fodder.

In the mountain ranges of northern Scandinavia and Alaska the reindeer graze on the slopes in the spring and summer; going higher and higher as the summer progresses, eating the green grasses as they emerge from the melting snows. In the autumn the reindeer return down hill to the lichen pastures in the valleys and spend the winters there. This feeding cycle keeps the reindeer in a cool climate and away from most of the summer insects.

In contrast, the Mackenzie reindeer spend all of their time on a low flat tundra situation where, in place of following the melting snow up the hillside, the reindeer follow the Spring northward to find the fresh green grasses where they grow around snowbanks. This situation allows little protection from the summer heat and hordes



of tundra insects. Often the reindeer can be found keeping cool by standing on a snowbank remnant or wading into the water.

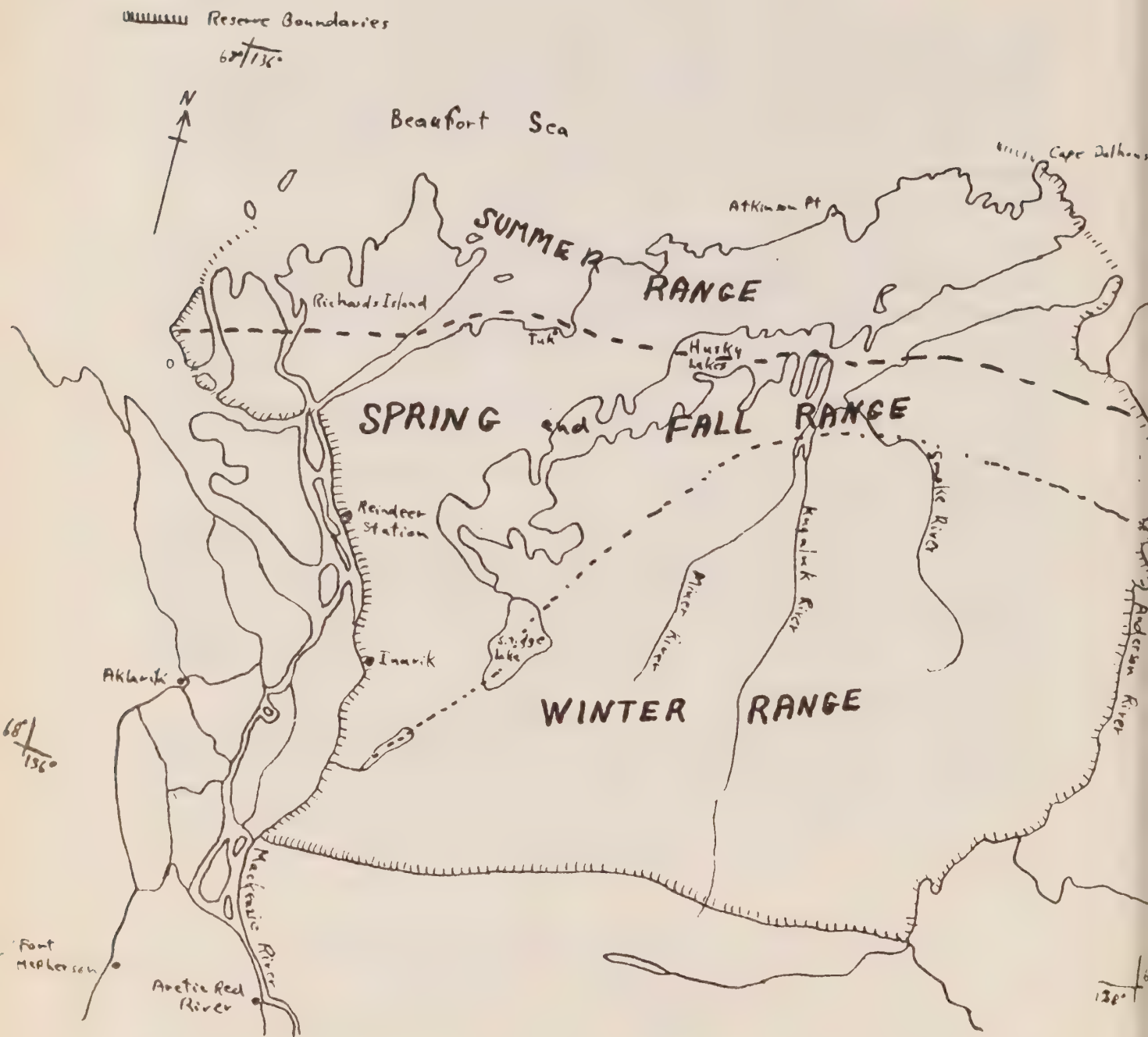
The reindeer move naturally from the coastal grasses in the summer to the lichen forest in the winter. The only herding that is required is the gradual changing of the seasonal movement paths so that over a period of years all of the available forage will be utilized and no part of the Reserve will be over utilized. There is a requirement for a utilization program to plan the future range pattern for optimum utilization of the Reserve. The Mackenzie Reindeer Reserve grazing areas are shown in Map 3.

Associated with this optimum utilization of the Reserve is the reduction of damage to the Reserve from natural and human factors. Range fires must be prevented and their damage minimized. In 1965 there was a range fire close to the Inuvik airport started by lightning. This fire was well controlled by support from Inuvik and only a square mile of range was destroyed. However, in 1954 there was a large burn which could not be controlled. This fire ruined approximately 200 square miles of good grazing land around the Kugalik River (Cody 1963).

Recently there have been problems of direct range damage by oil company exploration equipment traversing the Reserve. In 1965 the corral site at Swimming Point on Richards Island was ruined for future use when supplies were off loaded there for an oil well. The damage was caused by the numerous tracks cutting up the area and the wiping out the available reindeer fodder. There have also been problems with seismic lines cutting off the insulating vegetation over the permafrost which, in many places, left deep water channels running for miles.

MAP 3

Mackenzie Reindeer Reserve Grazing Areas  
MACKENZIE REINDEER GRAZING RESERVE  
Scale 1" = 27 miles



#### IV HERD MANAGEMENT

- Introduction
- Initial Herd Management
- Reindeer Physiology
- Herding Methods
- Herd Size
- Herd Composition
- Seasonal Movements
- Roundups
- Natural Losses and Negative Influences
- Production Yield

## CHAPTER IV

### HERD MANAGEMENT

#### Introduction

Herd management involves the control of the reindeer to obtain the optimum economic value from the Mackenzie reindeer operations.

All of the animals of the rangifer species tend to form herds and to have a natural unwariness when in a herd. This unwariness and strongly developed herd instinct among the reindeer made the change from a wild animal to a domestic one relatively simple. In effect, the domestication has been merely accustoming the animal to man.

Herd management techniques vary in different areas. There are herds with slight control and a low degree of domestication where the yield is taken out mainly by hunting as with the 'wild' reindeer of Norway. There are also highly controlled herds of 100 to 200 reindeer as in Lapland which are followed intensively throughout the year and the yield is taken out in a manner close to that of a small dairy farmer.

In general, reindeer herd management for the Mackenzie reindeer operations can be compared to the Western North American methods for handling cattle if due allowance is made for the differences in the animals and in the ranges. The reindeer grazes on the range throughout the year, and because of the Arctic environment, food supplements in winter would be too expensive.

For the economic success of the reindeer industry it is necessary to adopt the applicable modern methods of the beef cattle industry.

The large scale Western type ranches, herding techniques, and corralling methods can be duplicated for a modern, efficient, reindeer operation. However, reindeer production efficiency can only be improved through better herd and range management. In contrast, beef production can be more easily influenced by nutritive supplements, shelters, highly developed breeding techniques, and treatments for diseases and insects.

Every aspect of the reindeer herd management is in a sensitive balance since both the reindeer herd and the reindeer range



can be severely effected by arctic weather conditions. By virtue of a long history and great size, the cattle industry will always be more sophisticated and more capable of correcting problems. For the reindeer operations all planning and actions must take full consideration of reindeer physiology and everything must be adapted to the reindeer's well being.

This section on herd management will review herding methods and the factors influencing herd size, herd composition, seasonal movements, roundups and negative influences. Reindeer herd dynamics and meat production will also be covered.

### Initial Herd Management

In the initial Mackenzie reindeer operations the herd management scheme was based on the practices then currently used in Lapland. The Lapps had been brought into Alaska for the training of local people in the skills of reindeer husbandry when the reindeer were first introduced in the 1890's. These Lapps were still active in Alaska in the 1930's when a herd was moved from the Nome area to the Mackenzie Delta. One of the original Lapps, Andrew Barr, led the fabled 'reindeer trek' to Canada (Lomen 1954).

For the arrival of the herd in Canada, three Lapps and their families from Northern Norway were hired under contract to guide the Mackenzie reindeer operations and teach local people how to handle the reindeer. Without the participation of these hardy Lapps, the reindeer operations would have been a complete failure at the beginning. They trained local herders, and in effect, guided the entire reindeer operations except for setting policies.

Quite logically, the methods used by the Lapps were the ones which they were long familiar with in Northern Norway and Sweden. There, the Lapp reindeer culture had flourished for generations on the basis of small herds averaging around 300 reindeer with each herd in close proximity to another herd. The Lapps were nomadic and followed the herds to different pastures as the seasons changed. A recent report from Sweden indicated that the Lapps earned around \$2,000,000 a year from the sale of reindeer meat and byproducts and that this production supported 3,000 Lapps with an average per capita income of only \$700 (Business Week, 2 January 1965). The present Scandinavian reindeer situation is shown in Table 17. The same procedures for this 'close' situation were used in both Alaska and Canada up to the present although the terrain and economy was quite different.

Table 17

Scandinavian Reindeer Situation

<u>Country</u>	<u>Number of Reindeer</u>	<u>Range in Sq Mi</u>	<u>1963 Income*</u>	<u>Value per 1000 Reindeer</u>
Sweden	250,000	620,000	\$ 1,910,000	\$ 765
Norway	240,000	420,000	1,140,000	475
Finland	<u>220,000</u>	<u>500,000</u>	<u>2,540,000</u>	<u>1,150</u>
Total	710,000	1,540,000	\$ 5,590,000	\$ 790

The industry supports 2800 families with an average of 250 reindeer per family producing an average family income of \$ 2,000.

\*Canadian Dollar Equivalent

Data from Scotter 1965

When referring to 'good reindeer management' on the Mackenzie reindeer operations, the methods and practices used by the Lapps up to around 1930 were referred to (Johansson 1965). However, the basic social and geographic situation was not the same around the Mackenzie Delta as in Lapland at this time. There was a large herd of some 3,000 reindeer and the range was of great size without natural boundaries such as mountain ranges. The herding methods were not adapted to the great change in the type of range. They remained 'close' as if the reindeer had to be completely controlled to prevent straying and mixing with other herds. The situation involved small farm techniques in an area where only large scale operations could economically survive. During the initial period of the Mackenzie reindeer operations, there were only a few houses at Reindeer Station and the herders with their families were living in tent camps which moved with the herds at all seasons of the year. At this time the aims of the operations were welfare orientated and there were thereby, few economic pressures to adapt modern herd management techniques.

During the initial period of the Mackenzie reindeer operations the herd size increased from 2,370 in 1934 to a maximum of 9,374 in 1942 as shown in Table 18. These figures are totals for all the Mackenzie reindeer operations and include the native herding units. For the year 1966/67 the figures are estimated on recent data as shown in Table 28. Between 1934 and 1966, there were 63,114 fawns reported, 28,263 animals slaughtered or reported lost, and 28,846 animals unaccounted for. This large number of animals unaccounted for amounted to an annual average of 12.8% of the herd and occurred despite 'close' herding methods to minimize all losses.

### Reindeer Physiology

Reindeer physiology is comparable to other members of the deer family with the slight exceptions that with reindeer antlers develop on both the males and females and the reindeer are able to switch to a lichen diet for the winter without adverse effects.

Reindeer are only semi-domesticated animals when compared to cattle, horses, or sheep. They require taming, and if left alone, revert to a wild state. The taming is accomplished by mixing young reindeer with older ones and through handling of the herd by herders and herd dogs. A reindeer herd with a high ratio of young animals is difficult to handle relative to a more mature herd.

Table 18

Herd Size with Increases and Reductions from 1934 to 1967

Year	No. Fawns	Reductions	Natural		Net Annual Increment	Herd Size End of Year	% Natural	
			Loss	Loss			Loss	Fawns
1934-35	-	-	-	-	-	2,370	-	-
1935-36	815	75E	150E	150E	615	2,960	5.1	35
1936-37	936	75E	71E	71E	790	3,750	0.9	32
1937-38	1,181	150E	689E	689E	342	4,092	14.0	32
1938-39	1,281	200E	142E	142E	939	5,031	2.8	31
1939-40	1,896	997	588	588	311	5,342	11.0	38
1940-41	1,934	422	219	219	1,293	6,635	3.3	36
1941-42	2,141	549	70	70	1,522	8,157	0.9	32
1942-43	2,411	865	329	329	1,217	9,374	3.5	24
1943-44	2,287	1,250	1,180	1,180	143	9,231	12.8	24
1944-45	2,173	1,571	1,224	1,224	-622	8,609	14.2	25
1945-46	2,100E	403	2,738E	2,738E	-1,041E	7,568E	36.0	24
1946-47	2,189	964	2,225	2,225	-1,000	6,568	33.4	29
1947-48	1,780	734	1,271	1,271	-225	6,343	20.1	27
1948-49	1,857	813	708	708	336	6,679	10.6	29
1949-50	2,104	784	780	780	540	7,219	10.8	32
1950-51	2,133	681	1,111	1,111	341	7,560	14.7	30
1951-52	2,302	790	550	550	962	8,522	6.5	30
1952-53	2,206	1,268	1,763	1,763	-825	7,697	23.0	26
1953-54	2,243	1,390	736	736	117	7,814	9.4	29
1954-55	2,172	1,427	715	715	30	7,844	9.1	28



Table 18 (Continued)

Year	No. Fawns	Reductions	Natural		Net Annual Increment	Herd Size End of Year	% Natural	
			Loss	Fawns			Loss	Fawns
1955-56	1,743	1,786	1,206		-1,249	6,595	18.3	22
1956-57	1,535	1,183	872		-520	6,075	14.3	23
1957-58	1,712	1,288	558		-134	5,941	9.4	28
1958-59	1,521	652	1,239		-370	5,571	22.2	26
1959-60	1,606	735	454		417	5,988	7.6	29
1960-61	1,960	676	446		838	6,826	6.4	33
1961-62	2,026	676	1,214		136	6,962	17.4	30
1962-63	2,175	920	583		672	7,634	7.7	31
1963-64	1,801	1,127	1,829		-1,155	6,479	28.2	24
1964-65	2,254	1,051	989		+214	6,693	14.8	35
1965-66	2,940	991	1,074		+876	7,569	14.0	44
1966-67	3,700E	1,770E	1,123E		+800	8,369	13.5	49
TOTAL	63,114	28,263	28,846		-	-	average	average
							12.8	30

E - estimated  
 1935-1939 Canada's Reindeer, 1940, Dept Mines & Resources  
 1938-1959 Krebs 1957  
 1960-1967 Reindeer Station records

Reindeer females normally breed when 16 to 18 months old except for around 2% which breed at 5 to 6 months. However, with adequate fodder and ideal range conditions as many as 50% of the female fawns will breed at 5 to 6 months and greatly increase the herd productivity (Druri and Mitushev 1965). At the 1965-66 winter slaughter in the Mackenzie reindeer operations 55% of female fawns slaughtered were found to be pregnant.

For male reindeer the growth of antlers begins early in the spring. Actual growth terminates in July and by August the antlers are completely hardened. Adult males shed their antlers shortly after the period of rutting in the autumn. The antlers of the female are smaller but possess the same shape as those of the male. The females keep their antlers throughout the winter and lose them shortly after fawning in the spring.

The reindeer prefer to live in regions where there is a relatively light snow cover. Their winter existence is directly dependent on lichens which provide the reindeer with food throughout the winter. The lichens are well adapted to regions of light snow cover such as found in most of the Mackenzie Reindeer Reserve.

For the Mackenzie reindeer operations the reindeer breeding season is from around August 20th to October 10th with the greatest number of females being serviced from September 1st to September 7th (Hadwen 1942). This breeding season is approximately six weeks earlier than that of the native caribou in the area. The sexual cycle in the Mackenzie reindeer, which are of Siberian descent, is around 20 days earlier than in Scandinavia (Johansson 1964a). This large difference in breeding times between the reindeer and local caribou makes it almost impossible for interbreeding to take place.

The period of gestation for all of the rangifer species is 217 days (Flerov 1952). During April and May the Mackenzie reindeer fawn.

At this time the weather is usually cold and dry on the Reserve relative to the May-June period for the local caribou fawns when the weather is likely to be wet with cold rain or slushy snow. The reindeer fawns are older and better able to take the cold wet weather when it comes. Fawns can stand quite a low temperature when dry, but if wet, a temperature around freezing can be fatal (Hart 1961).

This earlier fawning also has an economic advantage for the Mackenzie reindeer operations as the fawns have a longer time on the relatively lush summer pasture and can increase to a greater size before slaughter time.

The reindeer have adapted well to habitation in the cold arctic climate. They have no apparent problems with temperatures down to as low as minus 60 degrees Fahrenheit. However, high temperatures are tolerated with difficulty. Their sweat glands are under-developed and the reindeer have to regulate their body temperature during hot weather by an increase in breathing with an open mouth and lolling tongue (Flerov 1952). Thus in hot periods a reindeer is not able to browse and rest properly.

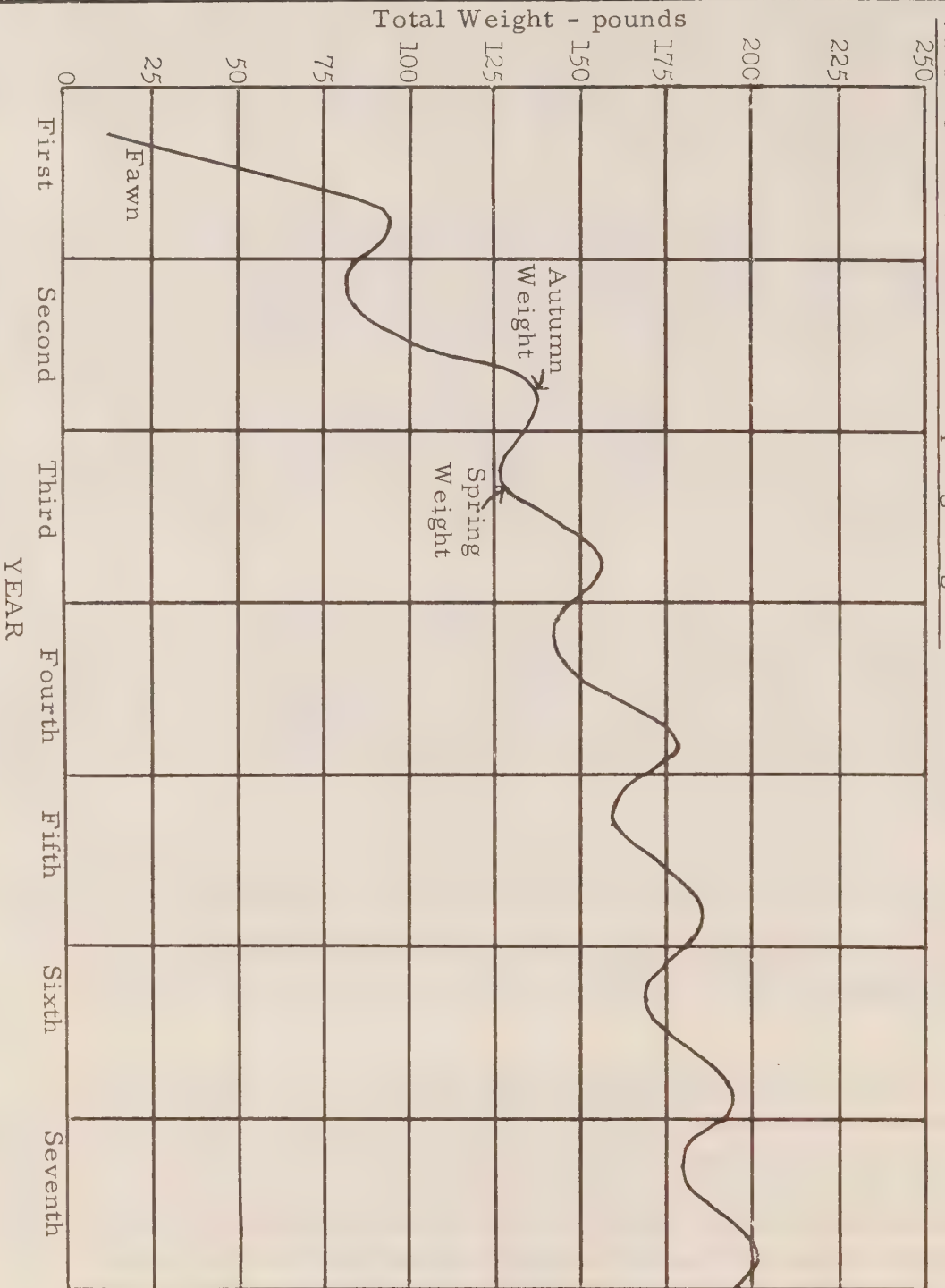
When the fawning season approaches the reindeer are directed to a favourable location where there is good grazing and where the spring sunshine has thawed clear spots on ridges and southward facing hills. It is preferable to have the fawns on areas free of snow as if the snow became wet it might cause the death of the fawns (Alaruikka 1958: 21). A newborn fawn weights around 10 pounds. Within a few hours after birth it scampers about and is able to keep up with its mother. The fawns nurse for a period of four to five months until the next rutting period in the following autumn. Reindeer twins are very rare.

Sexual maturity sets in early with the reindeer. There are many cases of one year old females bearing fawns and they may be considered as productive adults (Porsild 1947: 24). This amazing fertility of the reindeer is attributed to the excellent grazing conditions on the Mackenzie reindeer reserve (Clarke 1942). A very high percentage which would be as high as 95% of the adult females carry fawns every year.

The meat of the adult males is especially good during the summer until the rutting period which begins around August 25th. At this time the meat acquires a sour taste and pungent odour (Clarke 1942: 11). This meat remains unfit for consumption until the end of September when the animals are then relatively thin and gaunt.

During the summer and early autumn the reindeer have a rich and varied diet which allows the reindeer to build up reserves of fat throughout the body. Over the following winter, when the reindeer feed on lichen and have a poverty of nitrogenous substance, the surplus summer fat is gradually utilized and in the spring the reindeer are thin and relatively light in weight. This variation in seasonal diet and body weight is shown in Figure 8 which gives the variation in autumn and spring weights over a period of years for Swedish reindeer.

Figure 8  
Average Weights of Reindeer Illustrating  
Variation Between Fall and Spring Weights



Data from Fjell-Nytt, March 1961, p 16



The adult males are the first to fatten in the spring. Towards the end of March their condition has already improved and in June they are fat and sleek coated, though the fat is still reddish and vascular. They reach peak condition in August when the back fat becomes hard and white (Hadwen 1942). The adult females are in good condition in the spring until their fawns are born around mid April to mid May. After fawning they lose flesh, but only a few actually become thin. The adult females do not reach their peak of condition until October after their fawns have been weaned and the rutting season has passed its peak.

The yearlings and fawns keep their fat most of the year except for the precocious ones who take part in the rut (Hadwen 1942). The birth weight of fawns is usually around 10-13 pounds. They double their weight in the first two weeks and grow to full size in 3 or 4 years. At six months the males are 20 pounds heavier than females; at one year the difference is 30 pounds and at three years the difference is 80 pounds (Alaska 1946). The growth pattern for male and female Mackenzie reindeer is presented in Figure 9.

The Mackenzie reindeer are comparable in size to the Alaskan reindeer. Both the Mackenzie and Alaskan reindeer are larger in adult size than the Russian reindeer even though they are from the same stock.

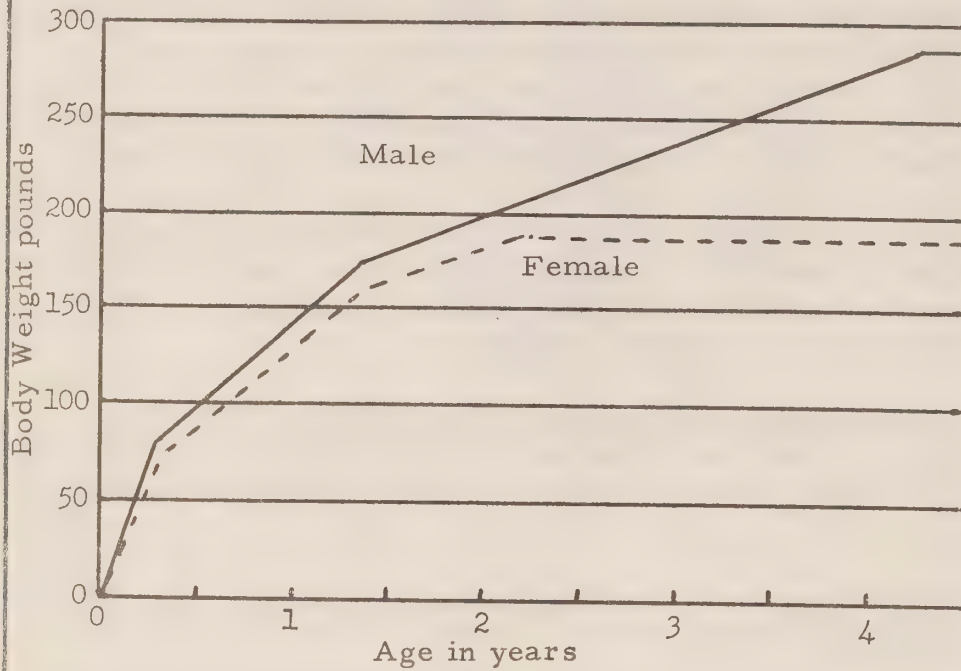
The difference is attributed to the richer fodder on the North American range (Krebbs 1957).

Mosquitoes and biting flies appear on the Mackenzie Reindeer Reserve around the end of June. From this time until the first frosts the reindeer will be bothered by these insects and will try to find places in the wind such as on a ridge or on the end of a point jutting out into the ocean or a lake. When the insects are thick the reindeer tend to move against the wind so that their faces are relatively clear of the insects.

### Herding Methods

Among the countries with reindeer there are many types of reindeer herding, but they can all be grouped into three basic methods - close herding, open herding, and free herding. In this section these three methods will be reviewed in relation to the Mackenzie reindeer operations.

Figure 9  
Growth Pattern of Mackenzie Reindeer



from Krebs 1957, p. 55

Close herding involves a constant watch over the reindeer throughout the year. This technique was developed for small herds on ranges where other herds were in close proximity or where predators were a problem. With this close herding method the economic yield compared to the manpower involved is very low. There are a limited number of reindeer that can be handled by a family unit using this method. It allows maximum utilization of the available production and at one time was the basis of the Lapp reindeer culture. However, in modern times, this method offers a low cash income per family and a relatively poor standard of living.

With close herding the reindeer are kept close together. This results in low utilization of grass or lichen forage since much of the available fodder is trampled instead of eaten. Also if close herding is used with large herds, the reindeer are continually disturbed in their grazing, rumination, or resting. The combination of disturbances has a bad influence on the reindeer's growth and health.

Close herding was used in the Mackenzie reindeer operations from 1935 to 1963. Many of the problems and high expenses of the initial operations can be attributed to the high labour cost of close herding and the attempt to keep close contact with all the reindeer so that none would be lost. Actually, there were still high unknown losses averaging 12.8% of the herd during the period that close herding was practiced (see Table 18). In addition there were problems of poor nutrition, bone weakness, and poor body condition that were probably brought on by the close herding technique.

The open herding method involves setting up a selected area of the range for the reindeer herd in which the reindeer are free to browse without being directly herded or bothered. A casual herd patrol is maintained so that when bunches of reindeer stray off from the herd area they can be rounded up and driven back to the area. This method allows the selection of specific areas of the range for grazing and allows optimum utilization of the available fodder.

Inside the large herd area the reindeer are free to seek the best pasture and the best places for resting, for protection against both temperature and wind, and for fawning. With the open herding little concern is given to natural losses as the main effort of herd management is concentrated on improving production. With an improved production rate, the unavoidable natural losses can be absorbed without a serious negative effect on the reindeer operations.

The only time the reindeer are herded is when they are being moved from one grazing area to another or when they are moved to a corral for roundup or slaughter. At critical periods such as fawning

herders circle the grazing area and keep an eye out for strays or predators. Much of the herd supervision can be carried out by air patrols. Often the reindeer can be left without any direct supervision for long periods.

The open herding method is a modern development in the reindeer industry that was brought on by the economic demands of a higher production per worker and an increased production from the ranges. This method is widely used by the Russian collective reindeer farms for handling large reindeer herds.

Open herding was introduced to the Mackenzie Reindeer operations in 1963 by the present management. Prior to this the herding responsibilities were somewhat diffused and complicated. There was a superintendent, assistant superintendent, chief herder, and senior herders. These people supervised a relatively small number of herders. With the introduction of open herding, the new management simplified the herding to a manager and seven herders. This staff with small changes is expected to be effective for handling up to 30,000 reindeer using modern management methods.

Free herding is a technique used in some reindeer operations where the reindeer are allowed to run completely free during most or all of the year. In effect, the reindeer are 'wild' and the free herding method uses game management methods for control and yield taking.

In some parts of Norway and Russia, the reindeer are allowed to run wild and the yield is taken out by hunters. There is no herding involved and very little control is exercised except for limiting the type and numbers of animals that are shot each year.

Another variation on free herding is carried out in Alaska on Nunivak Island where around 13,000 reindeer are left completely alone except during the annual roundup and slaughter in August. At this time the reindeer are rounded up with the assistance of airplanes and driven to a central corral and abattoir.

Free herding is limited to the few areas where there are natural boundaries such as on an island or where herding is too difficult to be economic as in a forested area. The method is very economical on manpower, but can only produce a limited yield relative to close and open herding methods.



In 1957 a Lapp reindeer specialist M.N.P. Utsi was requested to visit the Mackenzie reindeer operations and make proposals for improving the operations. He recommended that more of the Reserve be utilized for grazing and that open "extensive" herding replace the close "intensive" herding then practiced. He reasoned that open herding gave the herders greater freedom and that it largely eliminated reindeer diseases (Utsi 1957b). To facilitate the open herding he suggested that long fences be erected to assist in collecting the reindeer as they changed from one range to another. Some of the long fences were erected some time later, but proved unsuitable due to improper positioning in valleys where the reindeer walked over them at will after they were covered with snow. The basic recommendations of using more of the Reserve and open herding were very sound and have been put into effect. In the present operations, control of the reindeer with open herding is realized with extensive aircraft reconnaissance rather than with fences.

### Herd Size

The size of a reindeer herd is limited by the grazing area, available fodder, and herding methods. For the Mackenzie reindeer operations A.E. Porsild in 1929 recommended large commercial herds on the range as there were no natural boundaries to separate a number of small herding units (Porsild 1929).

As there are large areas available for grazing in the Mackenzie Reindeer Reserve and as the open herding methods requires little manpower, the main limit on the size of the herd is the amount of available fodder on the range. In the section on range management under grazing capacity, a conservative estimate of the practical herd size on the Reserve was 30,000 reindeer. However, the actual number that the Reserve could support on a continuing basis would have to be followed closely from year to year to insure that there was not at any time too many reindeer for the range to support.

When the proper herd size is determined, great care must be taken to insure that the herd size is kept reasonably constant so as to make optimum use of the range. A bad winter could decimate the herd and require a period of herd buildup. Also a reindeer herd can increase very rapidly if it is not controlled. The Alaskan reindeer 'explosion' is a case in point. Between the years 1900 and 1930, the Alaskan reindeer population increased under favourable conditions from a few thousand reindeer

to an estimated 640,000. This great increase occurred despite fairly heavy slaughtering and natural losses. In 1930 the Alaskan range was greatly over utilized and a population crash followed due to malnutrition (Hanson 1952).

The proper herd size must be arrived at by continuous examination of the forage in the grazing areas and the body condition of the reindeer.

### Herd Composition

The reindeer herd composition of females and males made up of fawns and adults is extremely important for the production efficiency and control of the herd. Many additional designations such as bulls, steers, calves, yearlings, and cows are common but for the sake of simplicity and ease of understanding only the basic herd composition elements are used in this study. This simplification of herd structure ties in with the open herding methods as with it there is no need to differentiate other than females, males, fawns and adults.

The number of adult productive females in a herd is the governing factor for yields and control of herd size. To complement the females there have to be enough males to service them.

With the Lapp herding methods it is common to castrate male fawns in their first year and take the yield as steers at the age of two to four years. However, with the demands of higher efficiency and use of open herding the importance of steer production has declined. The time and effort involved in castrating is not wholly returned in the form of better or higher meat yields.

Reindeer studies in Scandinavia and Russia have shown that with the high growth rate of fawns combined with the high fawn losses over their first winter, there is a marked production advantage of taking a high yield of fawns in the autumn (Johansson, 1964: 9).

There are numerous discussions in reindeer research studies on the number of females that a male reindeer can service at breeding time. These studies vary from 1 male for every 7 females (Krebbs 1957) to 1 male for every 30 females (Scotter 1965). Practical experience and an average of the studies indicates that a herd composition of 1 male for every ten females would be sufficient. An optimum age grouping of the adult males

would be 30% age 2 years, 10% age 3-4 years, and 10% over 4 years (Druri and Mitushev 1965).

Although females have preserved their fertility up to 20 years with a lifespan of 25 years (Flerov 1952), a female is best kept to an age of six years so that, when slaughtered, it will produce a quality meat product. For the same reason, a mature male is best kept until 7 or 8 years of age before slaughter.

### Seasonal Movement

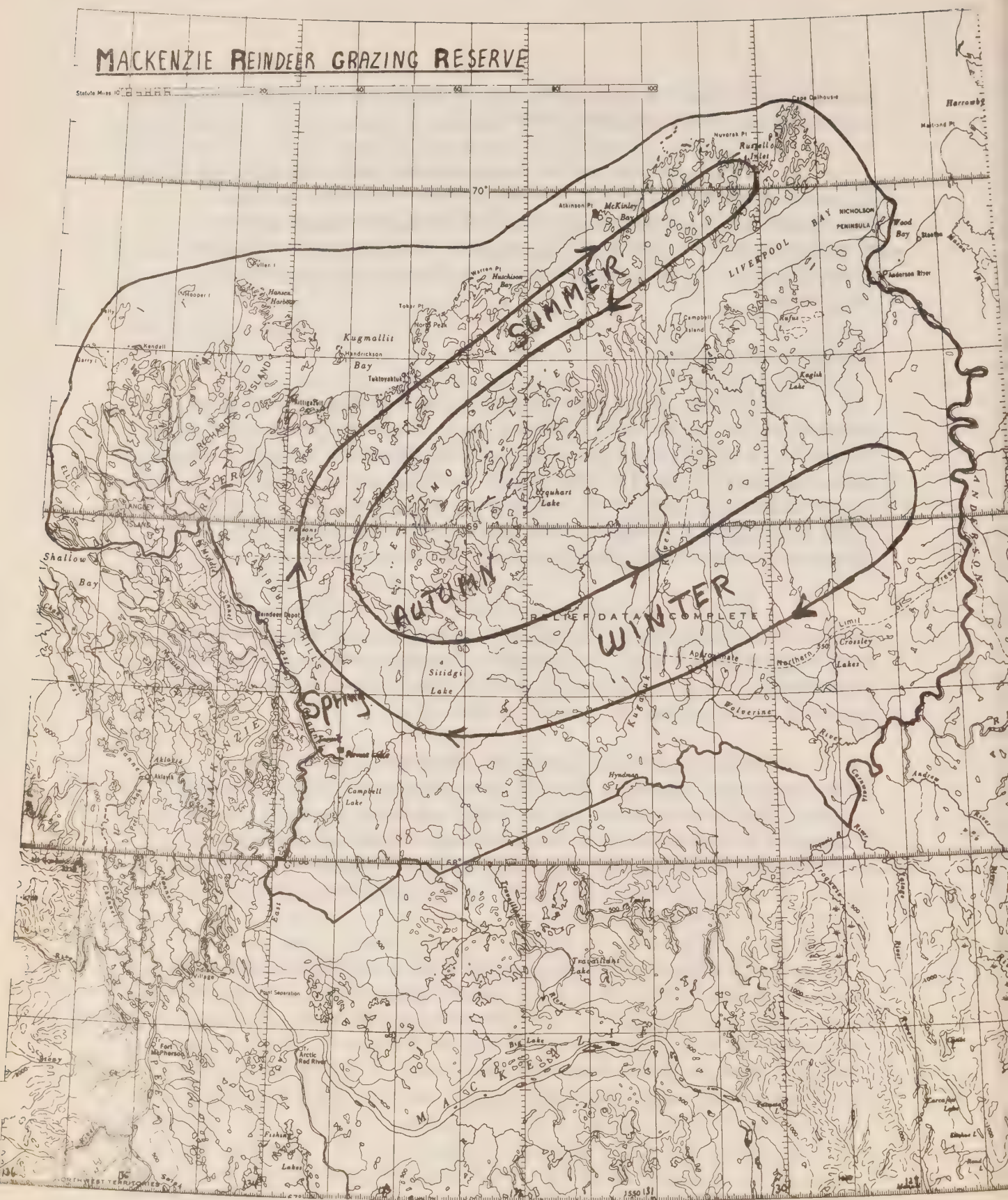
During the initial period of the Mackenzie reindeer operations the main herd summered on Richards Island and wintered in the Noel Lake area south of Reindeer Station. This seasonal movement of the reindeer utilized only a small fraction of the Reserve. However, at various times the native herding units made use of ranges to the east of the Anderson River and the area around Tuktoyaktuk and the Eskimo Lakes.

With the collapse of the last native herding unit and the introduction of open herding, a new seasonal movement was possible that makes full use of the available ranges on the Reserve. In this new movement the reindeer follow an annual cycle in the shape of a horseshoe as shown in Map 4.

This 'horseshoe movement' allows the reindeer to fawn in the spring on the high dry area northeast of Reindeer Station. Then as spring advances the reindeer move up to the coast and follow the Spring, with its new green grasses, as it progresses northward. The reindeer summer on the Tuktoyaktuk peninsula where there is excellent summer fodder and fair protection from the summer heat and insects.

As autumn arrives, the reindeer return southwards down the Tuktoyaktuk Peninsula and pass around the western end of the Eskimo Lakes. By the time winter has arrived and the snow cover is extensive, the reindeer are in the taiga forest. Here in the southern section of the Reserve, the snow remains soft and the lichen cover provides excellent winter fodder for the reindeer.







This 'horseshoe movement' has considerable flexibility for the choice of grazing areas as the routes can be varied readily. The movement is most suitable for the present herd of around 8,000 reindeer and should be as suitable for 30,000 reindeer. Should the herd size become too large to handle or some areas become over utilized for summer grazing, then a part of the herd can be directed to Richards Island or along the south shore of the Eskimo Lakes. For winter grazing the vast areas of upland tundra and taigo forest can be organized into grazing areas so that no particular area is over utilized.

This 'horseshoe movement' ties in well with herding and slaughter operations. The movement is natural for the reindeer and they would basically follow this pattern without any herding. Reindeer Station is central to the 'horseshoe' and relatively close to the fawning grounds where the reindeer require the greatest protection by the herders.

During the summer the reindeer are 'close' to the Atkinson Point slaughter facility for an extended period as they travel up and down the Tuktoyaktuk Peninsula. During the autumn and winter the reindeer pass relatively close to the Inuvik slaughter house and small herds can be readily driven to it.

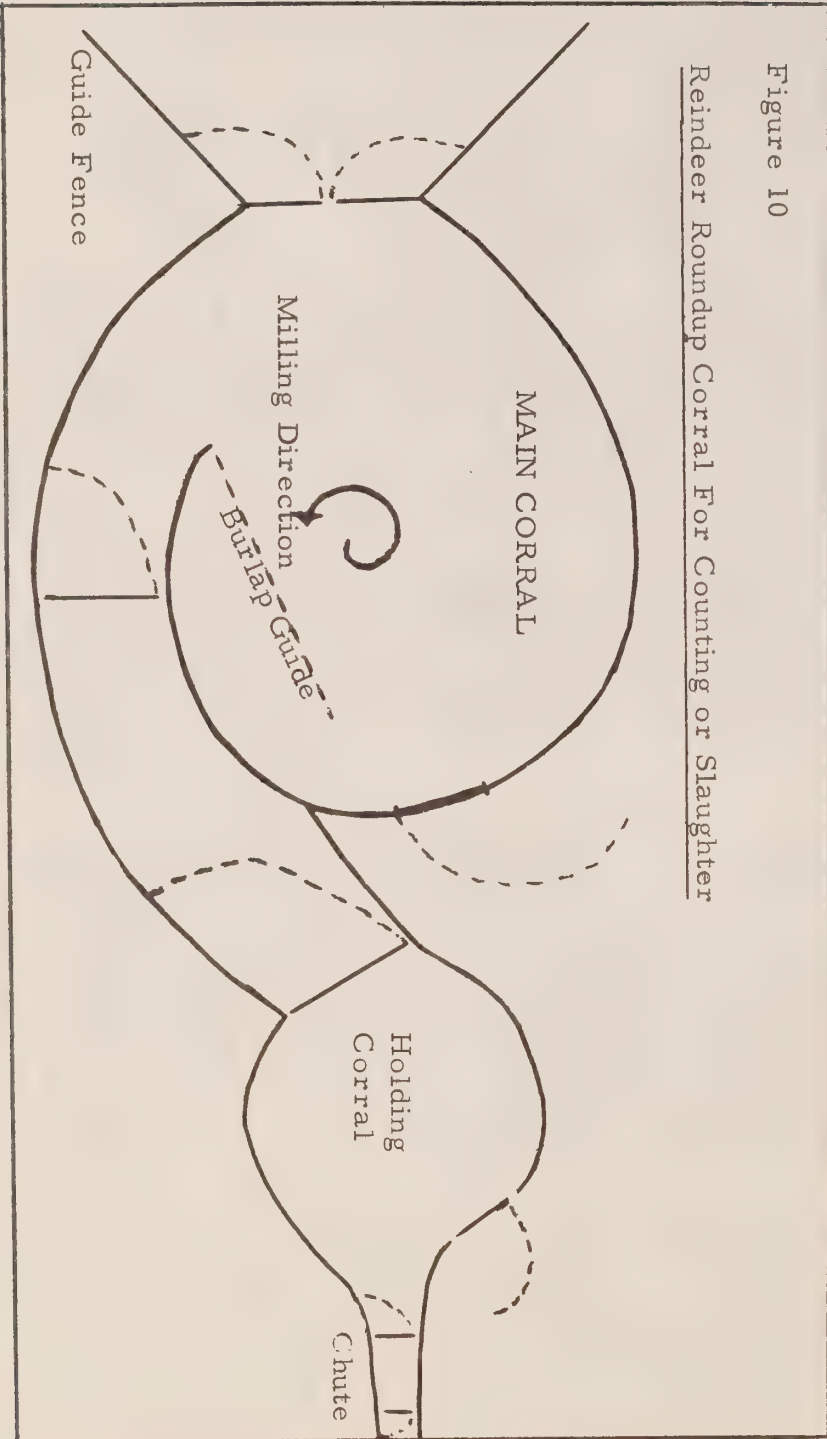
### Roundups

Roundups are a traditional feature of reindeer operations. In the Lapp reindeer culture the annual roundup was a festive occasion in addition to the corralling, marking, and separating of the reindeer for the many owners. During the initial Mackenzie reindeer operations the annual roundup was held regularly to count the herd and ascertain the number of missing and unaccounted for reindeer. This roundup was usually held in July. A roundup corral design is shown in Figure 10 which makes use of the natural counter clockwise milling habit of the Mackenzie reindeer.

With open herding the roundup solely for counting the reindeer is much less important. There is no need to mark the reindeer since there are no other herds to mix with. Since there are uncontrollable natural losses in every reindeer operation throughout the world, this loss is assumed and all available energies are directed towards herd production rather than finding out the extent of the losses.

Figure 10

Reindeer Roundup Corral For Counting or Slaughter



Because of the great extent of the Mackenzie Reindeer Reserve it will always be very difficult to bring all the reindeer together for an effective count at a roundup. There will always be some strays left out which will require some estimation of their numbers. These strays will affect the accuracy of the count of reindeer in a corral. Care must be taken that the expense of rounding up strays is not greater than the animals are worth. A band of 50 stray reindeer is only worth around \$1,000 on the range at \$25 per animal. This amount could easily be spent in trying to bring the stray band into the roundup corral as two men costing around \$50 per day might take 20 days to bring these strays in.

There is a definite place for roundups in any operation since it provides a measure of herd viability. Persons familiar with reindeer operations can estimate the number of reindeer in a herd with a probable accuracy of 10%. However, these sight estimates are usually not considered reliable enough for the 'authorities' responsible for the reindeer as the figures cannot be checked.

Before a roundup is carried out there should be an estimate of the expenses involved and these should be compared with the value of the results that could be obtained from the roundup. A rough estimate of a roundup cost is \$7,000 for a herd of 10,000 reindeer and \$11,000 for a herd of 30,000 reindeer (see Table 19).

In the present Mackenzie reindeer operations the manager has an up-to-date working knowledge of the location of the reindeer and their number. This information is obtained by regular reconnaissance flights.

When a roundup is held, care should be taken that the reindeer are not negatively influenced. Previous roundups in July were often held on hot days which proved fatal to many reindeer in corrals. Every effort should be made to limit the handling of the reindeer and keep them in a corral for as short a time as possible.

During the summer there is a natural segregation of adult males from the general herd. Advantage could be taken of this situation by using this period to round up bunches of males for driving to slaughter or a roundup (Clarke 1942: 11).

Table 19

Estimated Expenses of Reindeer Roundups

<u>Herd Size</u>	<u>10,000</u>	<u>30,000</u>
Airplane Charter	\$ 1,000	\$ 2,000
Herder Expense (8)	4,000	(10) 5,000
Corral Upkeep	<u>2,000</u>	<u>4,000</u>
Total	\$ 7,000	\$11,000



Small well-trained Border Collie dogs are used to assist the herders in rounding up the reindeer and in herding them from one place to another.

The most effective way to count reindeer is with aerial photography. Russian experience with this technique shows that photos taken from 2,000 feet can be used to count a total reindeer herd and that photos from 500 feet are used to establish the adult, yearling, and fawn composition of a herd (Druri and Mitushev 1965).

Aerial photos for herd counts are usually taken in the spring and summer. Only three or four hours are required to photograph a large herd spread over a great area. The main advantages of aerial photography counts are their minimum expense, and that the herd is not bothered by the process.

#### Natural Losses and Negative Influences

Reindeer are subject to many influences which can affect them in a negative manner. A number of these influences will be briefly covered in this section. Many of these influences, either alone or cumulatively, are fatal to the reindeer and account for natural losses of the herd.

Between 1935 and 1966 there were 28,846 reindeer reported missing for unknown reasons from the Mackenzie reindeer operations (see Table 18). This figure amounted to an average annual loss of 12.8% of the herd. In addition to this number there were considerable reindeer lost to known causes such as predators or sickness. It is probable that there were total losses due to natural causes amounting to 15% of the herd every year.

During this period, extensive measures were taken to minimize this loss. However, in spite of great efforts and considerable expense, the losses continued at around the same level.

This natural loss of animals in the Mackenzie reindeer operations seems very high when it is compared with other domestic animals. However, these high natural losses are common in all reindeer countries. In Sweden normal natural losses are

considered at 16% of the herd with over 50% of this loss being fawns (Rennaringen 1966). In Alaska natural losses are considered to be  $6\frac{1}{2}\%$  of the adults and 15% of fawns each year (Alaska 1946). The main variation seems to be in the explanation of the losses rather than the numbers lost (Johansson 1964a).

For the future of the Mackenzie reindeer operations it is expected that though better knowledge of negative influences and factors effecting herd increase, the number of natural losses can be reduced to around 10% of the herd each year. The negative influences related to this herd management problem are now reviewed.

a) Severe Winter Weather: Should a wet freezing rain cover parts of the Reserve with a layer of ice, the reindeer would probably not be able to dig through it to obtain their forage. When this situation happens the reindeer have to be moved immediately to an area of the range that is free of the ice cover.

Last year in Gaellivare, Sweden, it was reported that due to exceptional conditions early in the winter, losses of reindeer were greater than ever before and that some herds were reduced to half their size (Edmonton Journal, 5 March 1966).

b) Caribou Take Off: When a few wild caribou mix with a domesticated reindeer herd, the entire herd goes 'wild' and cannot be controlled. In effect, the reindeer herd takes off with the caribou. The major problems of reindeer herders in Alaska today is reported to be the increasing caribou population and their absorption of many reindeer herds (Tundra Times, 24 August 1964).

Several investigators and the reindeer management from the beginning have stated that caribou are no longer found on the East banks of the lower Mackenzie River where the Reindeer Grazing Reserve is located (Porsild 1929, Banfield 1951: 13). To the west of the Reserve there are sometimes caribou on their migration from the Colville Lake area to the Liverpool Bay-Darnley Bay area. In 1950 this herd was estimated at 5,000 head (Banfield 1951: 8). These caribou periodically come into the southeast corner of the Reserve and pass through the Anderson River valley. Should this caribou herd migration move any further westward into the Reserve, action would have to be taken to eliminate the caribou or keep the reindeer widely separated from them.

Dr. A.E. Porsild in 1947 stated that "No wild caribou herds have ever entered the Reindeer Reserve", which at that time did not include the area around the Anderson River (Porsild 1947: 30).

c) Insect Pests: Warble flies and nose bot flies exert a negative influence on the reindeer in the summer by bothering them and keeping them from eating or resting. The warble fly spends part of its life cycle inside the reindeer and forms cysts under the reindeer's skin. When it emerges through the skin, holes are left which make the skin almost useless. The nose bot fly lives inside the reindeer's nose and tends to disturb the reindeer and restrict its breathing.

Other insects such as black flies and mosquitoes undoubtedly bother the reindeer but not as much as the warble and bot flies.

As a defence against insects in the summer the reindeer will gather on high places, on the ends of coastal points where there is a breeze or they will even stand for hours partially immersed in water.

d) Malnutrition: There are many causes of malnutrition among the reindeer but mostly they are related to herd management and available fodder. If the reindeer are close herded and do not get enough food and rest or if they are over exposed to insects, there will be signs of malnutrition. Also if the reindeer are grazed on over-utilized or poor range lacking balanced nourishment, they will soon have nutrition problems.

In 1955 there were severe malnutrition problems in the Mackenzie reindeer operations when there were many cases of foot rot and weak bones that would snap as the animals were walking. These problems were apparently corrected when the reindeer were grazed in other areas with the open herding methods.

e) Predators: Predators can exert a strong negative influence on a reindeer herd if they are not controlled. In the Mackenzie reindeer operations wolves and grizzly bears are the worst offenders. However, wolverine and lynx take their share. Large birds such as falcons and ravens are reported to kill many young fawns.

In the Mackenzie reindeer operations considerable effort is directed



towards hunting out any wolves or bears that are attacking the herd. Fast action is required as wolves have been known to kill as many as 40 reindeer in one night.

f) Poaching: Although the hunting of either reindeer or caribou is prohibited by law on the Mackenzie Reindeer Reserve, there have been several cases where hunters have wantonly slaughtered reindeer. In the spring of 1964 five persons were committed at Tuktoyaktuk for the illegal killing of reindeer.

Although the RCMP, Territorial Game Officers, and NA&NR administrators are well aware of their responsibilities to prevent poaching of the reindeer, considerable effort has to be mounted by the reindeer herders to discover and report any hunting of the reindeer within the Reserve.

At a recent Northwest Territories Council meeting in Ottawa, a motion was presented to allow hunting of caribou in the eastern half of the Reindeer Grazing Reserve (32nd Session NWT Council, Ottawa 1966). The motion was introduced as some Tuktoyaktuk residents claimed that there were 'thousands' of caribou in the area. Extensive aerial surveys by the Mackenzie Reindeer Operation management sighted only 200 caribou in the Reserve close to the Anderson River and estimated a total of 400 caribou in the area. An arrangement was proposed to allow the hunting of caribou in the Reserve, if they were there, since the range would be useless for reindeer if there were large numbers of caribou present. This type of activity to allow hunting on the Reserve or to limit the size of the Reserve can be considered as 'poaching' on the operations as a whole.

g) Parasites and Diseases: Reindeer are susceptible to numerous internal and external parasites and many animal diseases. However, if the herd is healthy and properly managed, the negative influence from these parasites and disease will be minimal. Care must be taken that any outbreak of parasites or disease is properly controlled. Complete supervision and assistance in this control can be expected from the government inspectors who check all carcasses at slaughter time.

Dr. S. Hadwen, an international authority on reindeer, made an inspection of the Reserve in 1939 and reported that the reindeer were in excellent condition and virtually free of parasites (Clarke 1942). Since that time there have been some spot reports of parasites and disease. However, recent reports indicate that the reindeer are in excellent shape and free of disease (Perry 1964).



h) High Temperatures: Because of the low coastal aspect of the summer range on the Mackenzie Reindeer Reserve the reindeer are subjected to high temperatures which have a negative effect on them. In the usual reindeer range the herds move higher up hills and mountains as the summer heat arrives. This is not possible on the Mackenzie Reindeer Reserve and the reindeer try to escape the heat by moving to the Arctic Coast. Much of their time there is spent standing in water or bunching on the end of a sandspit where there is a breeze. These activities also serve to minimize insect annoyance.

Summer temperatures have been recorded as high as 80°F at Atkinson Point (11 June 1962) where the reindeer spend much of their summer. These high temperatures on a range where there is no shade keep the reindeer from eating and building up their body conditions. Possibly the Mackenzie Reindeer Reserve has the highest summer temperature of any reindeer range in the world.

#### Reindeer Herd Dynamics

Reindeer herd dynamics involves the management of increases and decreases in herd size and control of the number of animals available for slaughter to provide optimum yields. Herd dynamics are effected by the composition of the herd, and natural losses. When these factors are ascertained for a particular herd, an operations model can be set up that will give an indication of the future situation for that herd. At best the model can only predict and adequate safeguards must be allowed to compensate for the high risks that are normal in all agricultural operations.

For the reindeer operations, herd dynamics can be separated into six sections:

1. Herd composition at the beginning of the period.
2. Fawn increases.
3. Natural losses.
4. Slaughter reduction.
5. Change from fawns to adults during period.
6. Herd composition at end of period.

With definite numbers, parameters, and assumptions made for these six sections, an operations model of the reindeer herd can be set up.

Usually the period for the model is taken as one year. For recording simplicity either the calendar year or a fiscal year can be used. The procedures taken to establish a herd model may be compared to those used by an accountant in arriving at a balance sheet for a corporation where there is a starting balance, various additions and subtractions, and a final balance.

A theoretical form of the reindeer operations model is the steady state where the beginning number in the herd and the herd composition is the same as the final figures at the end of the period. A variation on the steady state is a programmed percentage increase or decrease in herd size.

For a practical operations model the actual number of reindeer in a herd is used at the beginning and various assumptions are made to determine the herd size and composition at the end of the period or over several consecutive periods.

A practical operations model will be utilized later in the economic study of the Mackenzie reindeer operations. The methods used in setting up these models and setting parameters are relatively simple. A business computer could readily handle the program and effectively present alternate models. By sections the herd dynamics model is set up by establishing that:

1. The herd composition would be best at 90% females with a 6 year turnover and 10% males with a  $7\frac{1}{2}$  year turnover.
2. Fawn increases are anticipated at 75% of the number of females in the herd. This percentage is arrived at by assuming that  $\frac{5}{6}$  of the females will be two years of age and older and that 90% of these will produce surviving fawns. These figures are modest as many of the year old females can be expected to carry fawns. It is assumed that half of the fawns will be female and half male.
3. Natural losses are assumed at 10% of the number of initial adults and surviving fawns. Although the natural loss during the initial operations averaged 12.8%, it is assumed that improved range and herd management will

keep the natural losses at less than 10% of the herd.

4. Slaughter reduction is the number of animals taken out for meat. The numbers and types available for slaughter is dependent on the state of the herd and whether it is being built up or not. For steady state operations the number to be slaughtered is controlled by other parameters such as natural losses and turnover rate.
5. At the end of the period the fawns born during the period become adults which then must be added to the net number of adults remaining in the herd.
6. The herd composition at the end of the period is merely the mathematical result of the additions and decreases in sections 1 to 6. The herd composition at the end of the period is the same as the beginning of the next period. It could be left out but it serves a useful purpose in checking results and making up ratios and percentages.

Using these parameters herd dynamics were set up as shown in Table 20 for reindeer herd steady state, increases, and decreases. The letter "N" is the total number of reindeer in the herd.

The steady state reindeer herd dynamics for herds varying in size from 30,000 reindeer to 5,000 reindeer are shown in Table 21. It is noteworthy that even with relatively moderate parameters of 90% females, 10% natural losses, female turnover of 6 years and male turnover of  $7\frac{1}{2}$  years that it is still possible to slaughter over 50% of the herd every year and maintain steady state conditions.

### Production Yield

The production yield from a reindeer operation is dependent on the number of reindeer that can be slaughtered without affecting the programmed herd size. The yield is usually expressed in numbers of animals slaughtered or the pounds of meat produced. In actual practice all of the reindeer byproducts are a part of the yield. However, for simplicity, only the meat production will be considered in this section.

Table 20

Reindeer Herd Dynamics      "N" represents total number of reindeer in herd.

- assuming herd composition of 90% female and 10% male
- 75% of females have surviving fawns
- 10% losses of total herd from natural causes
- reductions taken to adjust herd size and maintain same percentage of females and males

Steady State

No. at beginning of year	N - 90% female and 10% male		
Fawn addition (75% of females)	0.675 N	half female and half male	
Less losses (10% of total)	0.1675N	- 0.12357N female and 0.04375N male	
Less reductions	0.5075N	- 0.21375N female and 0.29375N male	
No. at end of year	N - 90% female and 10% male		
<u>For Increase in Herd Size</u>	<u>10% Increase</u>	<u>20% Increase</u>	<u>30% Increase</u>
No. at beginning	N	N	N
Fawn addition	0.675 N	0.675 N	0.675 N



Table 20 (continued)

Less losses	0.1675N	0.1675N	0.1675N
Less reductions	0.4075N	0.3075N	0.2075N
No. at end	1.1 N	1.2 N	1.3 N
For Decrease in Herd Size	10% Decrease	20% Decrease	30% Decrease
No. at beginning	N	N	N
Fawn addition	0.675 N	0.675 N	0.675 N
Less losses	0.1675N	0.1675N	0.1675N
Less reductions	0.6075N	0.7075N	0.8075N
No. at end	0.9 N	0.8 N	0.7 N

Table 21

Steady State Reindeer Herd Dynamics\*

Class	Start of Year	Fawn Increases	Natural Losses	Slaughter Reduction	Fawns to Adults	Total End of Year
30,000 head						
Adult-female	27,000	-	2,700	1,800	4,500	27,000
-male	3,000	-	300	100	400	3,000
Fawn-female	-	10,125	1,013	4,612	(4,500)	-
-male	-	10,125	1,012	8,713	(400)	-
TOTAL	30,000	20,250	5,025	15,225	-	30,000
25,000 head						
Adult-female	22,500	-	2,250	1,500	3,750	22,500
-male	2,500	-	250	83	333	2,500
Fawn-female	-	8,450	845	3,856	(3,750)	-
-male	-	8,450	845	7,273	(333)	-
TOTAL	25,000	16,900	4,190	12,712	-	25,000
20,000 head						
Adult-female	18,000	-	1,800	1,200	3,000	18,000
-male	2,000	-	200	66	266	2,000
Fawn-female	-	6,750	675	3,075	(3,000)	-
-male	-	6,750	675	5,809	(266)	-
TOTAL	20,000	13,500	3,350	10,150	-	20,000

Table 21 (Continued)

<u>15,000 head</u>					
Adult-female	13,500	-	1,350	900	2,250
-male	1,500	-	150	50	200
Fawn-female	-	5,062	506	2,306	(2,250)
-male	-	5,063	506	4,356	(200)
TOTAL	15,000	10,125	2,512	7,612	-
					15,000
<u>10,000 head</u>					
Adult-female	9,000	-	900	600	1,500
-male	1,000	-	100	33	133
Fawn-female	-	3,375	337	1,538	(1,500)
-male	-	3,375	338	2,905	(133)
TOTAL	10,000	6,750	1,675	5,076	-
					10,000
<u>5,000 head</u>					
Adult-female	4,500	-	450	300	750
-male	500	-	50	17	67
Fawn-female	-	1,688	169	769	(750)
-male	-	1,687	169	1,452	(67)
TOTAL	5,000	3,375	838	2,538	-
					5,000

\* assuming herd of 90% female, 75% surviving fawns, and  
10% natural losses

In the initial Mackenzie reindeer operations the production yield was orientated to slaughtering steers at an age of three to five years. This practice was dropped with the introduction of open herding as it was considered too expensive since the steers required herding for a long time, they were subject to natural losses, and the emasculation of the fawns was time consuming.

With the new herd management programs the potential meat production from steady state operations is presented in Table 22. These figures were calculated from the number of animals slaughtered as given in Table 20 and multiplying by the average carcass weight of the animal types. Based on this model the Mackenzie reindeer operations can produce 3,722 lb of reindeer meat annually per every 100 animals in the herd. The potential production per worker for a herd of 10,000 reindeer controlled by 8 herders is 46,000 lb per year. For a herd of 30,000 reindeer controlled by 10 herders, the average production per worker will be 111,000 lb per year.

These estimates compare favourably with reindeer yields in Russia where the production per 100 animals varies between 4,600 and 8,800 lb per year. In Finland the production is between 3,300 and 4,400 lb per year per 100 animals (Alaruikka 1960: 20). The average production per worker in Russia is 5,720 lb. One collective farm is reported to have achieved the production of 12,540 lb per reindeer worker. In Finland the production figures per reindeer worker vary between 3,000 and 3,500 lb per year. However, if these figures were distributed to the active workers only, the yield would be 4,400 to 4,800 lb per worker per year (Alaruikka 1958; 22).

In the steady state operations the number of fawns taken each year amounts to 65% of the year's fawn crop. This rate is relatively moderate compared to the number of fawns slaughtered in some other reindeer operations. On the collective farms in northern Russia it is reported that 75% of the year's fawn crop is slaughtered every year (Alaruikka 1960: 25).



Table 22

Potential Meat Production from Steady State Operations

<u>Herd Size</u>	<u>Number Slaughtered</u>		<u>Fawn</u>		<u>Dressed Carcass</u>		<u>Weights*</u>		<u>Total Weight</u>
	<u>Adult Female</u>	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Adult Female</u>	<u>Male</u>	<u>Fawn Female</u>	<u>Male</u>	
30,000	1,800	100	4,612	8,713	216,000	14,000	276,720	609,910	1,116,630
25,000	1,500	83	3,856	7,273	180,000	10,820	230,600	508,258	929,678
20,000	1,200	66	3,075	5,809	144,000	9,240	182,480	406,606	742,326
15,000	900	50	2,306	4,356	108,000	7,000	138,360	304,955	558,315
10,000	600	33	1,538	2,905	72,000	4,620	92,240	203,303	372,163
5,000	300	17	769	1,452	36,000	2,380	46,120	101,659	186,152

\* adult female 120 lb, adult male 140 lb, fawn female 60 lb, fawn male 70 lb

## V SLAUGHTER AND PACKING

- Introduction
- Time of Slaughter
- Slaughter Technique
- Slaughter Facilities
- Storage
- Packing and Shipping
- Quality Control, Inspection and Grading
- Ren Lake and Atkinson Point Facilities
- Capital Cost of Slaughterhouse Improvement

## CHAPTER V

### SLAUGHTER AND PACKING

#### Introduction

The Mackenzie reindeer operations are fully orientated towards the herding of reindeer on the Reserve. The operations can be compared to a cattle ranch where the main function is the herding of cattle for sale at a livestock market or direct to a packing house. However, because the Mackenzie reindeer operations are the sole reindeer organization in the region and as the operations are remote from consumer markets, a slaughter and packing facility has to be an integral part of the operations. In this section the slaughter and packing will be outlined.

The Mackenzie reindeer are a good type of animal for the production of meat. Their general physiology and meat producing characteristics are comparable to reindeer in other countries on ranges that are primarily within the Arctic. The Mackenzie reindeer has the advantage over the Lapp reindeer in that the fawning period is earlier in the Spring. With proper herd and range management the reindeer are stout and fleshy. They provide an excellent and tasty meat product with high quality standards.

All slaughter and packing operations have to be coordinated with available yields from the herd and market demand for reindeer products. The time of slaughter, slaughter technique, type of slaughter operations, butchering methods, storage, and packing will be discussed. In Table 23 the composite weight of a reindeer is given.

The proper handling of the reindeer prior to the slaughter is most important. If the animals are driven a long distance without rest, kept for a long time in a small enclosure, or badly frightened, the carcass meat will not be in a good condition.

During the initial Mackenzie reindeer operations the annual slaughter was an occasion for sightseers to come from the Delta communities. In the present operations this practice is discouraged as the slaughter is "messy" and as the visitors tend to get in the way and frighten the reindeer. Interested people and tourists are given a chance to see the reindeer at their best on special "Reindeer Days". For this occasion a herd is brought close to Inuvik on a large lake where everybody is encouraged to come out and take dog team rides around the herd and be served reindeer soup in a herd tent.

Table 23

Composite Weight of 4-Year Old Male Adult  
in Prime Fall Condition

<u>Component</u>	<u>Weight in pounds</u>	<u>Percentage</u>
Dressed Carcass	158.0	56.0
Entrails	57.0	20.1
Blood	20.5	7.2
Skin	16.0	5.6
Head	12.0	4.2
Feet	6.5	2.3
Antlers	5.5	1.9
Liver	4.0	1.4
Heart	2.75	1.0
Tongue	.75	0.3
	<hr/>	<hr/>
Total	283.00	100.0

Alaska 1946



### Time of Slaughter

The time of slaughter depends on many factors such as the optimum body condition of the reindeer, the type of animal to be slaughtered (i.e. fawns or adult males), condition of skin, the availability of transportation, weather influences on working conditions, availability of storage facilities, and the market demand for reindeer products.

The reindeer have natural periods of loss and gain. Reindeer lose 20-25% of their live weight compared to their best autumn weight towards the end of winter (Davydov 1958). This weight loss results due to the inferior winter feeding.

Surplus females are suitable for slaughter by late August and are at their prime in October-November. They tend to lose their body fat while carrying fawns and eating lichens between January and fawning in the spring.

The most economical age for the slaughter of reindeer appears to be six months as gain in weight relative to forage consumed decreases after this age (Scotter 1965). Fawn meat is comparable to veal in texture and taste. In the Scandinavian market, reindeer fawn meat commands a premium price over the adult meat. The fawn live weight and gain per month is shown in Figure 11.

The rate of meat production declines rapidly as the reindeer grow older. Figure 12 shows the meat production per half year for males and females. A reindeer slaughtered in the fall of its first year will produce around 50 lb of meat, in the second fall this figure is only increased by around 25 lb, and after seven years the increase is only around 7 lb.

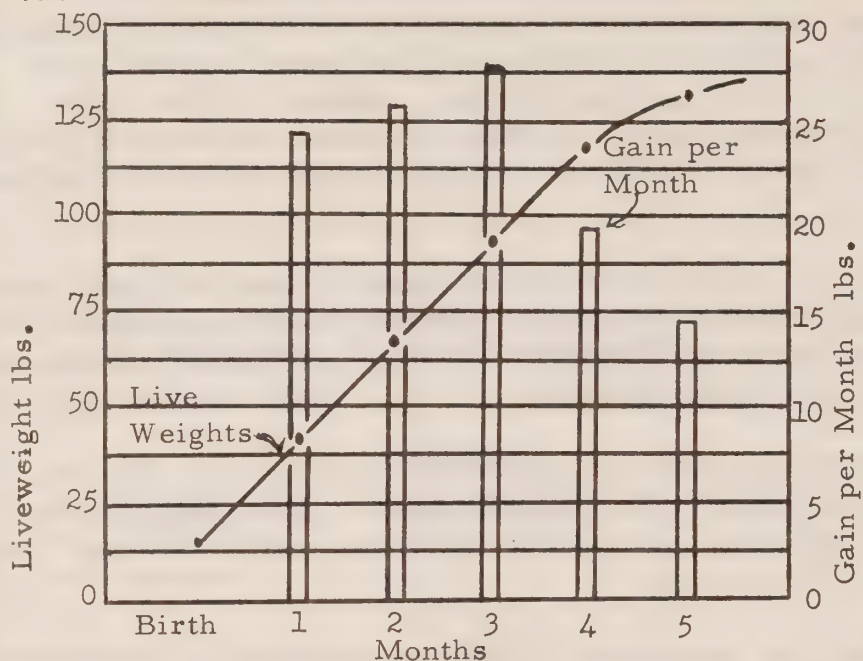
### Slaughter Technique

Reindeer slaughter techniques are comparable to those used in the beef industry. After the reindeer are picked for slaughter in a holding corral they are directed individually into a stunning pen where the following slaughter procedures are initiated:

1. stunning
2. bleeding
3. skinning
4. offal removal

Figure 11

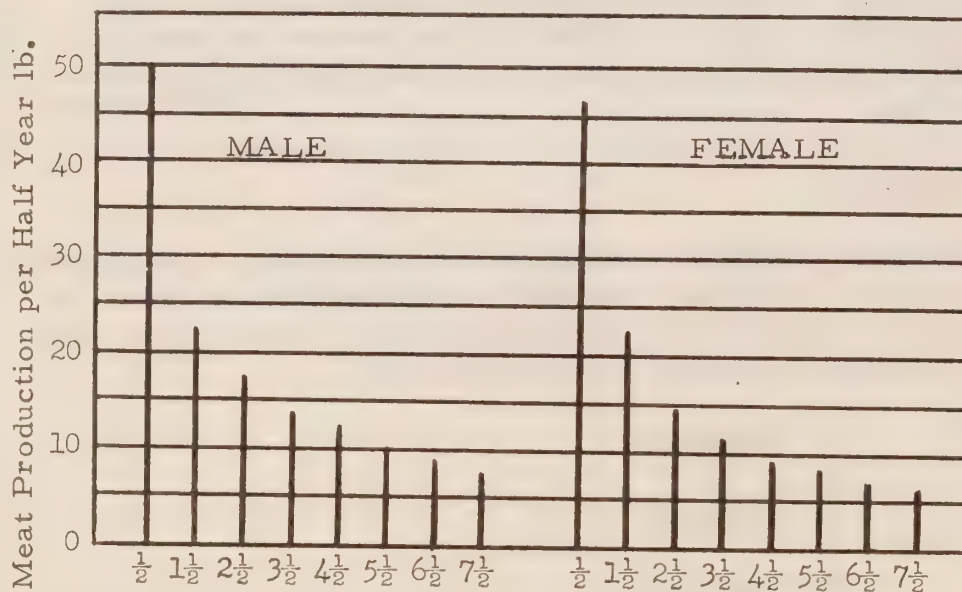
Fawn Liveweight Gains in First Five Months



Data from Druri and Mitushev 1965

Figure 12

Carcass Meat Production per Half Year



Data from Reindeer Modernization by Sven Persson

Samefolket No. 2, Feb 66, p. 35

5. splitting
6. washing
7. cooling

The equipment and methods used for these procedures varies with the slaughter facilities. However, the techniques remain the same whether the slaughter is carried out on a frozen lake or in a modern slaughterhouse.

The proper slaughter technique is most important to insure quality meat products. All of the slaughter procedures should be carried out as quickly as possible. There should be no longer than 30 minutes allowed between the time of stunning and when the carcass reaches the cooler.

Slaughter should be prompt and thorough drainage of blood should be allowed. During the skinning care should be taken not to bruise the carcass or puncture the skin. The stomach contents should not contaminate any part of the carcass. During the washing all loose material, saw cuttings, and hairs must be completely cleaned off. When the carcasses are cooling, sufficient air circulation must be allowed.

### Slaughter Facilities

For the production of quality meat, the Mackenzie reindeer operations must always utilize the best slaughter facilities available. Because of the great distances, weather variables, and market requirements, there are four types of slaughter facilities that can be used on the Reserve. There is the open facility where a frozen lake is used with no protection, a portable facility utilizing tents, a semi-permanent facility mounted on skids, and a permanent facility.

- a) Open Slaughter Facility: As the reindeer are herded from one grazing area to another it is common in the winter to hold an open slaughter on the ice of a small frozen lake. Usually the number of animals slaughtered is small and there is a specific requirement for the meat such as filling an overdue order or delivery to a nearby settlement.

A group of 1,000 to 3,000 reindeer are herded onto a lake where they begin to mill as a group. A herder with a rifle moves amongst the herd, chooses the reindeer to be slaughtered, and drops them with a shot in the head. The animals are then bled immediately, skinned, and the offal removed where they drop.



This open slaughter is only carried out in the winter and is the most hygienic of all facilities since the operations are carried out on fresh clean snow at temperatures well below freezing. No other method can be as sanitary.

- b) Portable Slaughter Facility: A portable slaughter facility is usually made up of tents which are set up close to a corral in summer or right on a frozen lake in the winter. The tents serve as protection from the cold in the winter and from insects and heat in the summer. When a large number of animals are being slaughtered, the portable facility can become quite elaborate with carcass rails, skinning benches, running water, electric lights, electric saws, cooling areas, and storage areas.

If the portable facility is located close to a corral, then it is used to select the reindeer for slaughter and direct them to a stunning pen. If the facility is on a lake in the winter, the reindeer are herded and selected in the same manner as with the open slaughter methods.

After the reindeer are dropped and bled on the ice they are usually conveyed to the portable facility where they are skinned, offal removed, and the carcasses cleaned. As an alternate procedure, the offal is removed on the ice at the time of bleeding.

- c) Semi-Permanent Slaughter Facilities: A semi-permanent slaughter facility is completely equipped and organized for large scale slaughters. It is located beside a large corral. The component buildings are all mounted on skids so that the entire facility could be moved to another location without much difficulty. The use of a semi-permanent facility is an alternate to the construction of a permanent facility at a specific location. It provides flexibility for the operation management as it can be moved to suit changes in herd or range management. A semi-permanent slaughter facility could be located on a barge and floated to most sections of the Reserve.

To date the Mackenzie reindeer operations have not used a semi-permanent facility but it has been given serious consideration as an alternative to constructing permanent abattoirs. Slaughter facilities in trucks and trailers are utilized experimentally in Sweden where there are numerous roads through the reindeer ranges.



- d) Permanent Slaughter Facilities: A 'permanent' slaughter facility was set up in the valley behind Reindeer Station in 1948 but has been little used because of its small size, lack of equipment, and location. A new permanent slaughter facility should be completed with a well equipped carcass handling room, coolers, and freezers which would all be tied in with electrical, water, and sewage facilities. Provision is required to meet all of the Department of Agriculture meat inspection regulations for the production of 'Canada Approved' meats.

With the present herd management program, permanent slaughter facilities are planned for Ren Lake close to the Inuvik airport and at the abandoned DEWline site at Atkinson Point which is around 60 miles northeast of Tuktoyaktuk.

### Storage

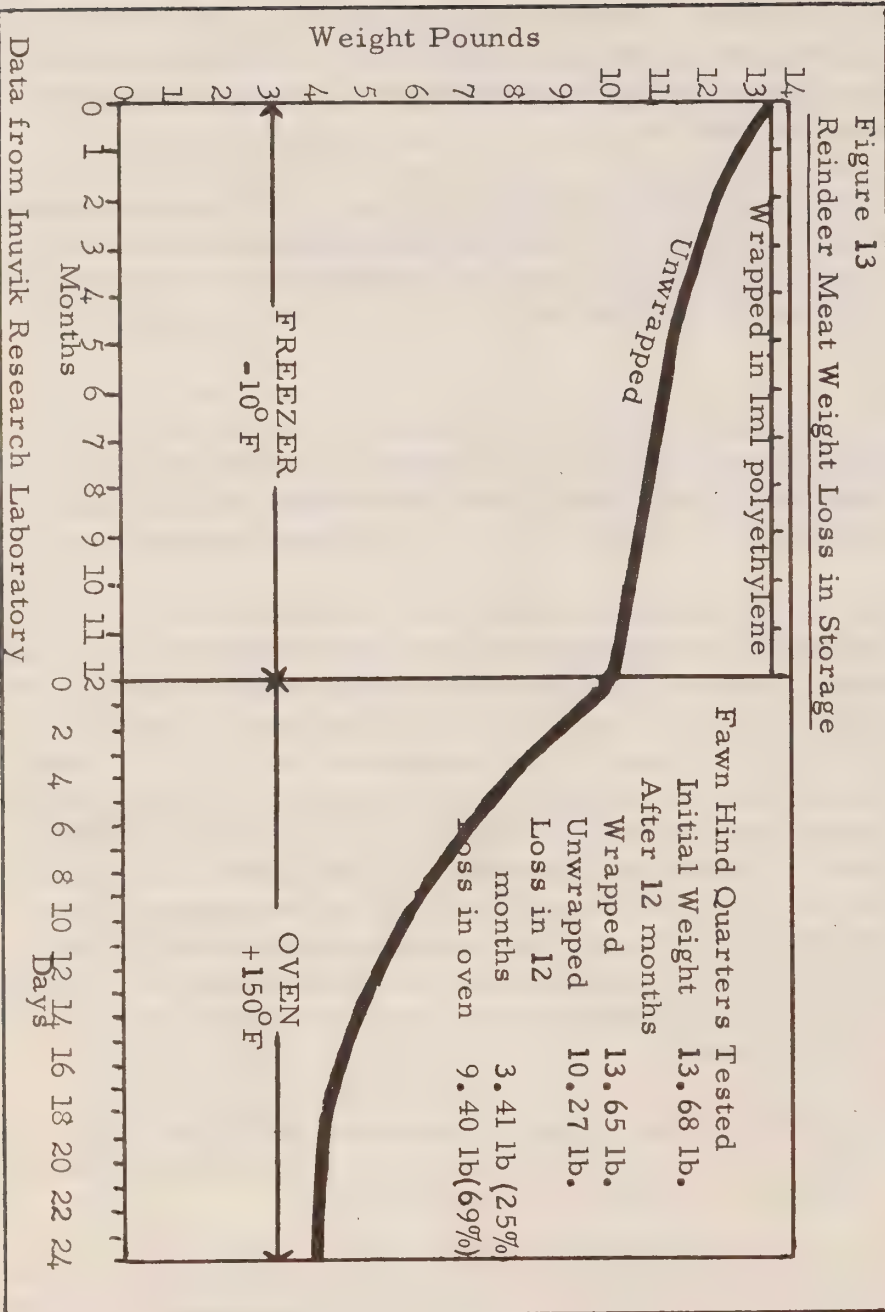
Meat is a moist foodstuff and as such is readily susceptible to spoilage by bacteria and moulds. For this reason storage areas must be kept as sanitary as possible and be maintained at proper temperatures.

Meat naturally contains proteolytic enzymes which are capable of breaking down the muscle fibre structure to some degree and make the meat more tender (Pike 1964: 71). This process of muscle fibre breakdown is irrevocably stopped at a temperature of 23-25 degrees Fahrenheit. For this reason meat is preferably held in a cool temperature for some time before it is frozen. Meat that is immediately frozen after slaughter does not possess quite such a good flavour and consistency as meat that is frozen after chilling. For chilling carcasses a temperature around 35° F is recommended with a relative humidity of 85-90% and 5-15 air changes per hour (American Meat Institute 1960). The chilling should continue for at least 24 hours as the tenderness of meat is affected quite markedly in this period.

Freezer holding temperatures should be at 0°F or lower (Ziegler 1964). After cooling, the meat must be frozen rapidly to prevent the formation of large ice crystals (Thornton 1962).

Reindeer meat stores well in freezers. A recent test on two rear fawn quarters in a freezer at -10°F for twelve months showed that wrapped reindeer meat lost almost no weight and that unwrapped reindeer meat lost only 25% of its weight over the twelve months (see Figure 13). If meat is being stored for a period longer than two months it should be wrapped in a vapour proof material to prevent drying out.

Figure 13  
Reindeer Meat Weight Loss in Storage



## Packing and Shipping

The packing and shipping of reindeer carcasses and products will vary with the transportation methods and the requirements of the consumers. However, for every sale the consumer must be assured of receiving a clean, well preserved product.

During the initial operations little or no packing was utilized. The carcasses were delivered bare although sometimes the skins were left on to 'protect' the carcass.

Cotton stockinette has been utilized for carcasses shipped outside of the Mackenzie Delta market. This material was not very suitable as it was difficult to insert the carcasses, it tore easily, and it did not adequately protect the carcass from contamination.

In the summer of 1965 plain plastic bags were utilized to pack quarters from the slaughter on Richards Island to the freezer in Inuvik. The bags protected the meat satisfactorily but they were difficult to handle and froze solidly to the meat in the freezer.

For the summer and winter slaughters in 1966, multilayered bags of kraft paper and polyethylene were utilized for packing. These bags worked quite well in the summer but were found lacking in the winter as they became brittle in the sub-zero temperatures. This combination of paper and plastic appears to be the best packing material for the carcasses as they protect the product, have a good appearance, and the contents can be described on the side of the bag. It is expected that a satisfactory combination of paper and plastic can be found that will stand up under cold temperatures.

Reindeer slaughters in the future will be carried out only at Atkinson Point and at Ren Lake. At these points shipping patterns can be established effectively and economically for the reindeer products. Ren Lake connects with Inuvik and the Inuvik airport by a winter road. Atkinson Point is only accessible by airplane or boat. For deliveries to Delta communities from Atkinson Point the ship Nanuk outfitted with a refrigerated hold will be utilized. Aircraft can also pick up meat for distribution from the landing strip at Atkinson Point. Ren Lake is around one mile long and can be utilized for aircraft pickup of reindeer products for distribution.

From a central distribution point at Inuvik the reindeer products can be shipped by barge, scheduled aircraft, or charter aircraft. In the future the roads connecting Inuvik to the south can be utilized for meat distribution.

The Northern Transportation Company Limited operates a freezer barge to Inuvik and Tuktoyaktuk which can be utilized to ship frozen products to upriver points. In truckload quantities (30,000 pounds) a shipping price of 5.25¢ per pound can be realized between Inuvik and Edmonton.

During the winter and under controlled conditions in the summer, aircraft can be used to ship reindeer products anywhere in Canada provided there are large enough volumes. Probably a backhaul rate of 10¢ a pound between Inuvik and Edmonton can be arranged when enough sales demand is generated.

### Quality Control, Inspection, and Grading

For continued market success of reindeer products, quality control, inspection, and grading of carcasses is necessary. Quality can be improved through range and herd management but the evaluation of this quality improvement has to be done at the time of slaughter.

The quality of the reindeer carcasses in the present operations is controlled through the examination of every carcass. This practice should be expanded to include grading in cooperation with federal meat inspection.

The meat inspection service of the Canada Department of Agriculture assures the consumer of quality meat and meat products from healthy animals slaughtered in establishments operating under government supervision. This inspection is compulsory for all meat sold from one province or territory to another and for export sales. Although it is not compulsory, most of the meat that is slaughtered and sold within a province is also federally inspected. Proof of inspection is the stamp "Canada Approved" on the meat itself.

Reindeer are subject to the Canada Meat Inspection Act and require the "Canada Approved" stamp for any shipments outside of the Northwest Territories. Under Section 2 (b) of the regulations reindeer are classified under game as is buffalo, moose, and elk (Wells 1964).

Qualification of a slaughterhouse facility for meat inspection service depends on the operation and sanitation of the facility as well as standard of building construction. Meat inspection is provided free except where the staff must work overtime.



An alternate to federal meat inspection would be Northwest Territory inspection under Territorial regulations. However, as there are few other food producing organizations in the Territories and it is desirable to be able to ship meat to the Provinces, this situation will not likely occur.

On Nunivak Island in Alaska the annual slaughter is inspected by the State Veterinarian. The meat is stamped with the Alaska State inspection stamp and marked "reindeer". This procedure meets the US Department of Agriculture requirements and interstate commerce regulations for shipping Alaskan reindeer meat to other States.

Grading of the carcasses at the slaughterhouse is required to insure that only quality reindeer meat will reach the consumers. Reindeer carcass grading is dependent on the following points:

1. General shape of carcass and proportion of meat to bone.
2. Amount of fat covering and distribution of fat through the lean.
3. Color and character of fat and bone.
4. Texture and color of the lean.

A relation between United States meat grades and average dressing percentage is shown in Table 24. The higher the grade, the higher the amount of carcass relative to live weight.

The Canada Department of Agriculture grades beef into seven categories thus:

- 1) Choice (red brand)
- 2) Good (blue brand)
- 3) Standard (brown brand)
- 4) Commercial
- 5) Utility
- 6) Manufacturing
- 7) Bull

A simpler grading classification for reindeer would include only three grades - Choice, Good, and Standard. A price differential would be established for each grade and only 'choice' carcasses would be shipped for sale to the provinces and export. 'Good' carcasses would be sold locally and used for herder's issue. 'Standard' grade carcasses would be used only for processing or canning. These grades would assure consumers of uniform quality.

Quality must be considered at the consumer level as the purchaser sits down to a reindeer meat dinner. Here consideration has to be given to the preparation of the meat as a bad cook can ruin even the best of food products. There is no way for the Mackenzie Reindeer Operations to control meat preparation so allowance must be given for this unknown when consumer complaints are received. In effect, the actual quality control must be exercised at the time of slaughter and every effort made to educate the public that reindeer meat should be handled in the same way as beef.

#### Ren Lake and Atkinson Point Facilities

Slaughtering facilities have been organized at Ren Lake close to the Inuvik airport and at Atkinson Point, an abandoned DEWline station on the coast 60 miles northeast of Tuktoyaktuk. These facilities tie in with the annual 'horseshoe' movement of the reindeer as described in the herd management section. Ren Lake is for the winter slaughter operations and Atkinson Point is for summer slaughters.

A slaughter was held on a small lake close to Ren Lake during the winter of 1964/65 which proved the area very satisfactory for the herding of the reindeer. The slaughter site was moved to the larger Ren Lake and set up as a kitchen and bunkhouse. A corral was erected and for the 1966/67 slaughter, a 16ft x 60 ft prefabricated metal building will be erected as the abattoir. Fresh water is available from Ren Lake and there is excellent drainage away from the Lake for abattoir waste water.

Ren Lake is located just off the "Edmonton Road" serving the telephone line to Inuvik. Through the winter it is readily accessible to Inuvik and the Inuvik airport by wheeled vehicles and snowmobiles. It will be possible to run a power line to Ren Lake from the Inuvik airport.

The slaughter facility at Atkinson Point was used for the 1965 summer slaughter and proved quite suitable. The DEWline buildings at Atkinson Point are under control of the Inuvik Research Laboratory. An arrangement was made with the Mackenzie reindeer operations permitting the use of the site for reindeer slaughters with the understanding

Table 24

Meat Grades and Average Dressing Percentage\*

Prime	63
Choice	59
Good	56
Standard	52
Commercial	53
Utility	48
Cutters	44
Canners	40

\* equals  $\frac{\text{Carcass Weight}}{\text{Live Weight}}$

Data from Fowler 1957

that the buildings would be available for scientific purposes as required.

For the 1965 summer slaughter the former 40 ft x 40 ft DEWline garage was converted into an abattoir and a corral was erected. Fresh water is available from a nearby lake and there is drainage away from this lake for abattoir wastes. The former garage building serves excellently for an abattoir as it is fully insulated, has a 20 foot ceiling, and has a cement floor sloping to drains. Underneath the building there is an extensive area that was made into a natural meat chilling room.

There is a 3,000 foot sand runway at Atkinson Point and a harbour capable of handling ships drawing up to eight feet of water. It is planned to utilize both airplanes and boats to ship out the reindeer carcasses. For a DC-3 airplane carrying 6,000 lb of meat the cost per pound for delivery to Inuvik is  $5\frac{1}{2}\text{¢}$  (Great Northern Airways quote of 5 May 1965). An Otter airplane carrying 2,000 lb would charge  $12\frac{1}{2}\text{¢}$  lb for the same trip (Pacific Western Airlines quote of 5 May 1965). For the 1966 summer slaughter it is planned to utilize the Northern Affairs and National Resources vessel Nanuk for carrying equipment to Atkinson Point and reindeer meat back to the Delta communities. The Nanuk is being outfitted with refrigerated compartments especially for this work.

#### Capital Cost of Slaughterhouse Improvements

For the continued operation of the project slaughterhouse improvements are necessary to permit meat inspection and the marketing of "Canada Approved" meat (Wolforth 1966). The capital expense of this slaughterhouse improvement will probably run between \$100,000 and \$200,000.

If this capital expense is amortized over ten years, and there are interest charges of 7%, the carrying charge for principal and interest on a \$100,000 structure for the first year would be \$13,871.40. It is noteworthy that for a production of 200,000 pounds of meat per year this would amount to almost 7¢ per pound of meat sold. This would be a considerable burden on the selling price of the meat if this sum had to be recovered.



In a review of the Alaskan reindeer industry it was estimated that the smallest slaughter facility that could be built to meet Government inspection would probably exceed \$100,000. These costs are for a single bed killing floor with an hourly capacity of 10-12 animals. Rendering and refrigeration facilities would be additional. The total facility would be amortized in at least ten years (Little 1963: 39).

The Central Alberta Dairy Pool recently erected a new prefabricated metal dairy building 80 ft x 92 ft in size. The building has been approved by the sanitary inspectors. The walls are made up of panels having a foamed in place plastic core with painted steel inner and outer walls (Food in Canada, June 1965, p 27). This type of building could be erected for the Mackenzie reindeer operations. Judson Packers Limited in Alberta recently erected a meat plant with 8,300 square feet of production area and a 20 ft x 20 ft freezer using 8 ft x 4 ft insulated steel panels for the sum of \$200,000 (Canadian Food Industry, February 1966, p 66). Ricker's Packers in Manitoba have recently erected a 60 ft x 50 ft cement block building for 50-80 hogs and 30-40 cattle per day which costs \$95,000. The meat cooler is large enough to hold 100 carcasses of beef (CDN Food Industry, September 1965, p 63). Comparable facilities are required for the Mackenzie reindeer operations with a large enough capacity to handle the programmed slaughter. The reindeer slaughter facilities can be built in stages as long as they can be expanded to handle the slaughter by the end of the 1967-77 operations model as shown in Table 25.

With the abattoir facilities that are already in operation at Atkinson Point and Ren Lake, the capital expenditure required to establish "Canada Approved" standards could possibly be held to around \$100,000. This amount would be split with \$57,500 expended at Ren Lake and \$42,500 expended at Atkinson Point as shown in Table 26.

At Ren Lake a new abattoir building will be required to supplement the "512" bunkhouse and 16 ft x 60 ft metal building that will be erected in the summer of 1966. It is expected that the outside arctic winter temperatures can be utilized for both cooling and freezing of the carcasses. Only a standby cooling unit is proposed. Electricity can be run in from the lines at the Inuvik airport. Limited employee accommodation is required to supplement the twelve man "512" building.

Table 25

Slaughter Production Rates Required for 30,000 Head Steady State

<u>Numbers Slaughtered</u>	<u>Atkinson Point</u>	<u>Ren Lake</u>	<u>Total</u>
adult - female	-	1,800	1,800
- male	100	-	100
fawn - female	2,812	1,800	4,612
- male	<u>5,113</u>	<u>3,600</u>	<u>8,713</u>
Total	8,025	7,200	15,225

Slaughter per Day

30 days at Atkinson Point	267	
25 days at Ren Lake		288

Slaughter Rate per Hour

8 hour day	33	36
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Table 26

Proposed Capital Expenditure for Abattoir Construction

<u>Item</u>	<u>Ren Lake</u>	<u>Atkinson Point</u>
Abattoir Building	\$ 30,000	\$ -
Abattoir Equipment	10,000	10,000
Cooling Facilities	2,500	10,000
Freezing Facilities	-	15,000
Utilities	5,000	5,000
Employee Accommodation	2,500	-
Byproduct Facilities	<u>2,500</u>	<u>2,500</u>
Total	\$ 57,500	\$ 42,500

At Atkinson Point the DEWline garage building will prove most suitable for an abattoir facility. Since summer slaughters will be carried out here, provision has to be made for mechanical cooling and freezing. It is also proposed to utilize "permafrost cooling" where possible. There is ample employee accommodation in the DEWline module.

Before any expenditures are made on abattoir facilities, a packing house consultant should be hired to insure that proper design and layouts are specified that will be acceptable to the Meat Inspection Division of the Canada Department of Agriculture.

VI RESEARCH

- Introduction
- Physiological Research
- Range Research
- Economic Research



## CHAPTER VI

### RESEARCH

#### Introduction

As the product sales from the Mackenzie reindeer operations are in competition with other meats and foods there is a continuing need to maintain and improve product quality and to improve operation economics. Research in the general sense is required to prevent and minimize problems in the range and herd management, to develop improved procedures for handling the reindeer and reindeer products, and to determine the optimum yields from the operations.

Since the Mackenzie reindeer operations are the only Canadian enterprise working with reindeer, much more basic research and development effort has to be carried out than for the usual business operating in a common industry.

There has been a great deal of research carried out in other reindeer herding countries. Much of this research is applicable to the Mackenzie reindeer operations but care and effort has to be taken in applying the results obtained from other countries. Intensive reindeer research began in Russia 40 years ago. This research is now paying off as the Russians have realized the most efficient reindeer operations in the world with a production efficiency in some areas reaching 9,000 lb per year for every 100 reindeer (Johansson 1966).

To achieve comparable results in Canada there is the need for much reindeer research. The Mackenzie reindeer operations can carry out much of the practical research but the full cooperation of government, university, and private research organizations is required for the effective improvement of the Canadian reindeer industry.

The Inuvik Research Laboratory operated by the Department of Northern Affairs and National Resources works on many projects for the Mackenzie reindeer operations. This laboratory facility is available to all investigators working in any scientific discipline. The Laboratory library probably has the most extensive collection of reindeer literature of any library in Canada. The full cooperation of the Inuvik Research Laboratory can be expected for any reindeer research projects.

Since reindeer and caribou are identical in their physiological and range needs, the results of studies on either rangifer are interchangeable. Where the reindeer are domesticated and relatively easy

to approach there are many studies which could be carried out on them which would have a direct bearing on the caribou problems across the Canadian Northland.

### Physiological Research

There is little research data available on the activities and biological parameters of the reindeer on the Mackenzie Reindeer Reserve. There is a requirement for basic data of all types so that differences between "typical" and "abnormal" can be ascertained for the many problems of reindeer physiology.

Selective breeding for the improvement of the reindeer stock for increased meat production is required but there has been no scientific research carried out in this field. An understanding of the reindeer body condition is needed to establish symptoms and cures for malnutrition. Data is needed on the composition of blood, muscle, bone, urine, faeces, and skin, and how this composition varies through the year and on different ranges.

The effects of insects on reindeer and methods for protecting the reindeer from these insects is a project requiring active study. The effect of climate on herd management poses interesting problems for improving production yield.

The effects of radioactive fallout on reindeer forage and meat has been thoroughly investigated but there is a requirement for continued study to determine any changes in the radioactive levels beyond the present limits which are considered harmless.

There has been some concern in Alaska and Sweden over the radioactivity level in reindeer meat. However, the present levels are not considered hazardous to humans in these countries (Scotter 1965). The Mackenzie Reindeer Reserve has a low radioactivity level because of the scant rainfall averaging only 9.75 inches per year. This is almost half that of Nome, Alaska, at 17.50 inches. The level of radioactivity in the Canadian reindeer operations is only one quarter that of Sweden (Lindell 1964).

The soft bone sickness of 1955, where the skeleton become so soft it could be cut with a knife, could reoccur and requires further investigation.

### Range Research

There is a continuing requirement for additional knowledge

of the reindeer range to determine the most effective grazing patterns for the reindeer. The variations in nutrient value for various species throughout the year needs to be known. The Canadian Wildlife Service are working on a study program of the reindeer range and its carrying capacity which will provide much valuable information.

In Russia there has been considerable research on the utilization of tundra vegetation. The vegetation has been defined and investigated by means of air photos and field research. Scientists have used this information to define the reindeer fodder resource potential and its possible increase (Alaruikka 1958: 16). This type of study could well be initiated on the Mackenzie Reindeer Reserve.

The consideration of food and mineral supplements to increase herd productivity is needed.

The influence of range fires on the vegetation and lichen fodder along with the time required for regeneration could be studied. Feeding trials in Sweden and Norway suggest that the use of supplemental feeds in the winter would carry more animals through the winter and give higher fawn weights at birth and at slaughter time, higher fawn survival, and higher milk production by the female (Scotter 1965).

The development and use of grass pastures in the autumn to fatten up animals for slaughter is an interesting project for research.

Information is required on the microclimate of the summer range so that the reindeer can be herded to areas where the high summer heat will have the least negative effect.

### Economic Research

Because the Mackenzie reindeer operations have only had limited sales experience in the Mackenzie Delta area, there is a requirement for extensive economic research to establish the best distributing and selling methods that will produce optimum returns to the operations.

Although it is known that consumers generally like reindeer meat, it is not known how they prefer to have it presented to them. Knowledge is required of the best sales techniques, methods of packaging, and labelling.

Continuing effort is required in perfecting an operations model, such as the one presented in this study, for the prediction of future herd changes.

Market surveys will be needed to assess the potential of reindeer markets and the problems of selling in these markets. The effect of price on sales volume and optimum returns to the operations is an important subject requiring study.



## VII OPERATION ECONOMICS

- Introduction
- Initial Economics
- Present Economics
- Future Economics
  - a) General
    - b) Herd Operations Model  
for 1967-1977
    - c) Probable Income from  
1967-1977 Operations Model
    - d) Probable Expense during  
1967-1977 Operations Model
- Economic Feasibility

## CHAPTER VII

### OPERATION ECONOMICS

#### Introduction

This section is concerned with the factors which effect the economic feasibility of the Mackenzie reindeer operations and the estimation of future income and expenses.

Reindeer husbandry can be described as an 'ideal' industry in the sense that no other domestic animal matches the reindeer for giving so much and taking so little. The complete animal is a marketable commodity with no waste. Reindeer thrive with little attention.

Less capital is required for a reindeer operation than for most other agricultural activities. For comparable results in a Northern area, the reindeer require less financial support and effort than any other industry that has been proposed to date. Reindeer require neither fences nor imported food; they produce meat for food and skins for clothing from a harsh land whose resources would otherwise remain unutilized (Abrahamsson 1963).

The slaughtering and meat packing industry operates on a very small margin. In 1964, the average profit on sales for the Canadian meat packing industry was less than 1% (0.9%) (Canadian Imperial Bank of Commerce Commercial Letter, December 1964). This same industry in 1964 averaged 8.7% profit on net worth, 8.5% return on total invested capital, 3.6% receivable to sales, and 5.5% inventories to sales.

When these same economic ratios are applied to a sales volume of \$100,000 per year, which is the present potential of the Mackenzie reindeer operations, the capital value of the operations would be only \$10,300.

#### Initial Economics

From the beginning up to the present, the Mackenzie Reindeer operations were not intended to produce income, be self sufficient, or profitable. The operations were a welfare undertaking. Throughout the operating history of the project there has always been some income but there has also been considerable expense. Since there was little

effort made to produce income, the earlier history can only provide an indication of the expenses involved in operating the project and are not particularly valid for the future.

Up until 31 March 1965, over a million and a half dollars had been expended on the Mackenzie reindeer operations. This amount includes almost \$300,000 for the initial investigations and purchase of reindeer. During the same period \$317,000 was received in income from the sale of products. The expenditures on the operations each year are graphically shown in Figure 14.

Over the years considerable quantities of meat and skins have been donated to schools and hospitals, several Eskimos were trained as herders, and a few native herding units were set up and recovered.

Within the framework of federal government accounting systems, the operation expenses were budgeted for each year in advance and any income to the operations was turned over to the Receiver General of Canada.

### Present Economics

Since 15 March 1963, the Mackenzie Reindeer operations have been under tight management control with a development program orientated towards economic self sufficiency of the project. During this period the project has operated under a management contract with the Department of Northern Affairs and National Resources which provided the continuance of funds.

For the years 1963/64 and 1964/65 there was a contract provision that half of the income from the sale of reindeer products would be rebated to the contractor. In this period the contractor generously expended more on the project than he received in operating funds. A rebate was recovered from the contractor's share of the sales income, but with considerable funds tied up in accounts receivable, the contractor in effect, took nothing from the operation for his management efforts.

For the contract periods 1965/66 and 1966/67, there was no provision in the operating contract for rebate of any of the sales income to the contractor.

The economic situation for the Mackenzie reindeer operations for the period from 15 March 1963 to the present is shown in Table 27. For the year 1966/67 the situation is estimated. The anticipated herd increase and reduction for this year are given in Table 28.

Figure 14

Government Expenditures on  
Mackenzie Reindeer Operations 1936-1966





Table 27

Present Economics for Mackenzie Reindeer Operations - Thousands

<u>Item</u>	<u>1966/67*</u>	<u>1965/66</u>	<u>1964/65</u>	<u>1963/64</u>
Income from Sales**	60	36	52	29
Operating Expenses				
Salaries	42	42	41	41
Extra Help	6	5	7	3
Aircraft	10	11	16	13
Fuel	12	14	14	9
Supplies	10	10	12	10
Cartage	4	4	4	1
Sales and Office	3	4	4	1
Miscellaneous	4	-	5	11
Total	<u>91</u>	<u>90</u>	<u>101</u>	<u>88</u>
Less Operating Income	<u>6</u>	<u>6</u>	<u>7</u>	<u>2</u>
Net Expense	85	84	94	86
Gross Position	(25)	(48)	(42)	(57)
Capital Expense	<u>5</u>	<u>19</u>	<u>19</u>	<u>16</u>
Net Position	(30)	(57)	(61)	(73)

\* estimated

\*\* sales from both Project and No. 4 Herd

Table 28

Anticipated Herd Increase and Reduction 1966/67

<u>Class</u>	<u>Start of Year</u>	<u>Fawn Increase</u>	<u>Natural Losses</u>	<u>Slaughter Reduction</u>	<u>Fawn To Adults</u>	<u>Total End of Year</u>
Adult-females	5,071		504	250	1,615	5,926
-males	2,497		249	470	665	2,443
Fawn-females	-	1,850	185	50	(1,615)	-
-males	-	1,850	185	1,000	(665)	-
Total	7,568	3,700	1,123	1,770	-	8,369

During this period of contract management operations, the economic situation was abnormal as the operations were reorganized from a welfare orientated project to a commercial project, considerable capital improvements were carried out, and the herd structure was changed. Sales were limited as not enough reindeer could be slaughtered to meet the demands of the consumers and still build up the herd size. Numerous improvements to the housing and corrals kept the herders occupied on non-productive work. The operating equipment was modernized and material inventories were enlarged.

Since a fixed monthly operating sum was paid to the contractor during this period, the 'expenses' of the operations were adjusted to meet the available funds and cannot be considered realistic figures for a 'commercial' operation. However, considerable experience in commercial operations was realized in this period and an accurate estimate of future expenses can be made.

The employees of the Mackenzie reindeer operations receive good salaries relative to the average worker in the Delta area. Including the benefits of free heated housing and monthly meat issue, the herders earn the equivalent of at least \$600.00 per month (see Table 29). Additional salary is paid to the senior herder and the equipment mechanic. These high salaries and pleasant working conditions attract good people who take an interest in their work and are productive. Since 15 March 1963, only one employee has left the operation and only one new person has been hired.

The present requirement for employee productivity is shown in Figure 15. This chart illustrates the rapid decline in 'labour content' of the Canadian farm production. The same social and economic conditions effect the Mackenzie reindeer operations and must be taken into account for continued success. To be competitive, modernization with efficient equipment and productive workers is essential for the Mackenzie reindeer operations.

### Future Economics

#### a) General

The future economics of a self supporting reindeer operation are dependent on the income from the sale of reindeer meat and byproducts and on the expense of running the operations.

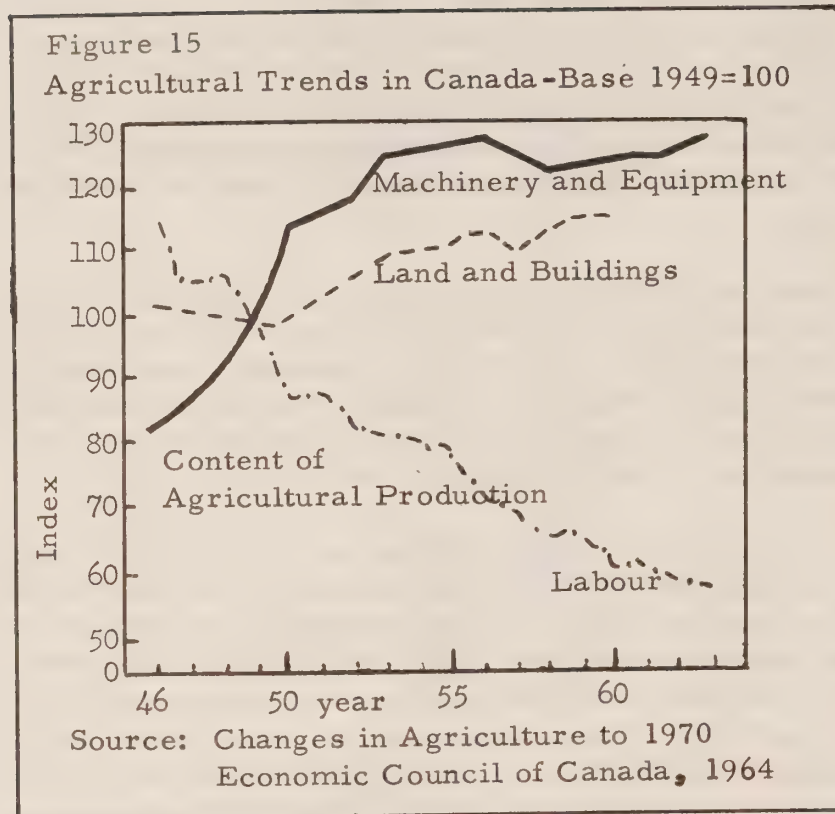


Table 29

Herders' Monthly Salaries

Cash Payment	\$350
Meat Issue 140 lb @ 55¢ lb	77
Value of House and Utilities	175
Total	\$602

Note: Herders work a 40-hour week with compensatory time off for overtime. This monthly salary of \$602 amounts to \$3.75/hour.



The available meat production from the 1967-1977 operations model and the potential sales for reindeer meat are presented in Figure 16. Both the optimistic and pessimistic estimate for potential sales are shown. This figure shows that, if the optimistic sales volume is reached, all of the available meat production will be sold. However, if only the pessimistic market potential is sold, there will be around half of the available production unsold in 1967/77. Presumably, if this situation arises, production from the herd will be modified to meet the actual market requirements. For the first five years of the operations model, the available production is less than the pessimistic estimate of the market potential and no difficulty is seen for the sale of all available production in this period.

On the optimistic assumption that all the available meat production will be sold during both the first and second five year periods of the model the income and expenses of the operation are shown in the next sections. It can be assumed, if the available production is not all marketable, that the expenses of the operation will decrease accordingly and that the figures shown will be comparable for volumes of meat production that vary from the model predictions. This should be particularly true during the second five years of the model as the basic operation expenses are covered by the sales income at the start of this period.

#### b) Herd Operations Model for 1967-77

Based on the herd management scheme presented earlier in this study a herd operations model for the period 1967 to 1977 has been prepared. The operations model is presented in Table 30 and a summary of the number slaughtered, production, herd ratios and production efficiency is presented in Tables 31, 32 and 33.

The model design allows for the increase in herd size from 9,378 reindeer to the planned steady state level of 30,000 reindeer. It also programs the increase in females from 76% of the herd to 90% and an improvement in the animal turnover to six years for females and seven and a half years for males. The slaughter reduction has been planned to build up the meat supply gradually to match the planned increase in sales. Also an increase in production efficiency is programmed by taking a higher percentage of the fawns for meat production.

Figure 16

Available Production and Potential Sales 1967-1977

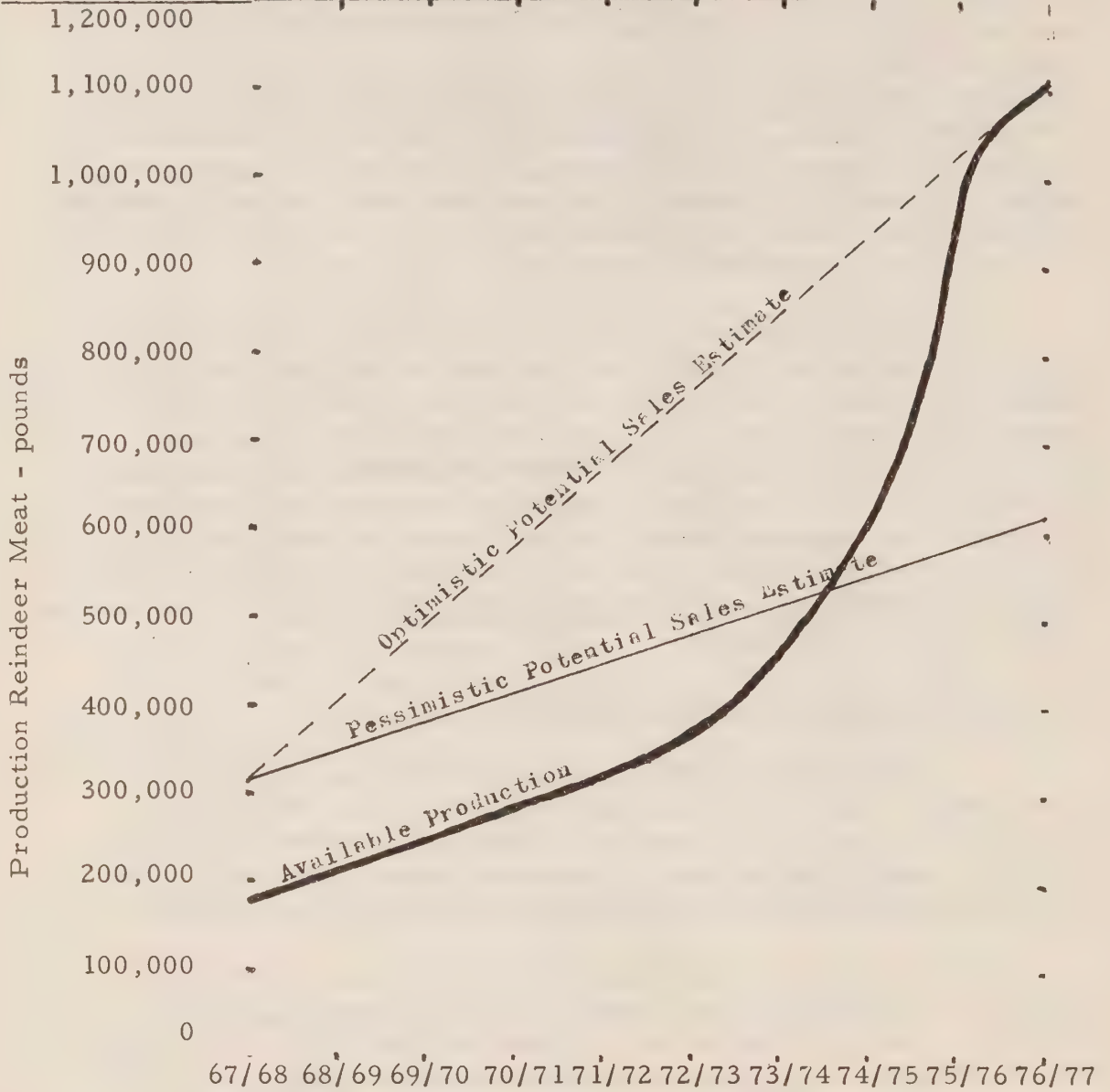


Table 30

Herd Operations Model for 1967-1977

Year	Class	Start of Year	Fawn Increase	Natural Losses	Slaughter Reduction	Fawns to Adults	Total End of Year
1967/68	Adult-female	5,926	-	593	200	1,948	7,081
	-male	2,443	-	244	400	498	2,297
	Fawn-female	-	2,220	222	50	(1,948)	-
	-male	-	2,220	222	1,500	(498)	-
	TOTAL	8,369	4,440	1,281	2,150	-	9,378
1968/69	Adult-female	7,081	-	708	200	2,326	8,499
	-male	2,297	-	230	400	376	2,043
	Fawn-female	-	2,640	264	50	(2,326)	-
	-male	-	2,640	264	2,000	(376)	-
	TOTAL	9,378	5,280	1,466	2,650	-	10,542
1969/70	Adult-female	8,499	-	850	200	2,807	10,256
	-male	2,043	-	204	400	357	1,796
	Fawn-female	-	3,175	318	50	(2,807)	-
	-male	-	3,175	318	2,500	(357)	-
	TOTAL	10,542	6,350	1,690	3,150	-	12,052
1970/71	Adult-female	10,256	-	1,026	200	3,505	12,535
	-male	1,796	-	180	400	555	1,771
	Fawn-female	-	3,950	395	50	(3,505)	-
	-male	-	3,950	395	3,000	(555)	-
	TOTAL	12,052	7,900	1,996	3,650	-	14,306

Table 30 (continued)

1971/72	Adult-female	12,535	-	1,253	200	4,180	15,262
	-male	1,771	-	177	400	730	1,924
	Fawn-female	-	4,700	470	50	(4,180)	-
	-male	-	4,700	470	3,500	(730)	-
	TOTAL	14,306	9,400	2,370	4,150	-	17,186
1972/73	Adult-female	15,262	-	1,526	200	5,012	18,548
	-male	1,924	-	192	500	1,062	2,294
	Fawn-female	-	5,625	563	50	(5,012)	-
	-male	-	5,625	563	4,000	(1,062)	-
	TOTAL	17,186	11,250	2,844	4,750	-	20,842
1973/74	Adult-female	18,548	-	1,855	300	6,005	22,398
	-male	2,294	-	229	500	1,256	2,821
	Fawn-female	-	6,950	695	250	(6,005)	-
	-male	-	6,950	695	5,000	(1,256)	-
	TOTAL	20,842	13,900	3,474	6,050	-	25,219
1974/75	Adult-female	22,398	-	2,240	400	6,925	26,683
	-male	2,821	-	282	500	925	2,964
	Fawn-female	-	8,250	825	500	(6,925)	-
	-male	-	8,250	825	6,500	(925)	-
	TOTAL	25,219	16,500	4,172	7,900	-	29,647
1975/76	Adult-female	26,683	-	2,668	1,400	4,385	27,000
	-male	2,964	-	296	300	632	3,000
	Fawn-female	-	10,000	1,000	4,615	(4,385)	-
	-male	-	10,000	1,000	8,368	(632)	-
	TOTAL	29,647	20,000	4,964	14,683	-	30,000
1976/77	Adult-female	27,000	-	2,700	1,800	4,500	27,000
	-male	3,000	-	300	100	400	3,000
	Fawn-female	-	10,125	1,013	4,612	(4,500)	-
	-male	-	10,125	1,012	8,713	(400)	-
	TOTAL	30,000	20,250	5,025	15,225	-	30,000



Table 31

Summary of Herd Operations Model for 1967-1977

<u>Year</u>	<u>Herd Size End of Year</u>	<u>Number Slaughtered</u>	<u>Pounds Meat Production</u>	<u>Slaughter Percentage</u>	<u>Female Turnover</u>	<u>Male Turnover</u>
1967/68	9,378	2,150	188,000	23 %	3.6	4.6
1968/69	10,542	2,650	223,000	26	3.6	5.4
1969/70	12,052	3,150	258,000	26	3.7	5.0
1970/71	14,306	3,650	293,000	25	3.7	5.5
1971/72	17,186	4,150	328,000	22	3.7	2.7
1972/73	20,842	4,750	363,000	23	3.7	2.1
1973/74	25,219	6,050	471,000	24	3.7	2.2
1974/75	29,647	7,900	603,000	27	3.8	3.2
1975/76	30,000	14,683	1,073,000	48	6.2	4.7
1976/77	30,000	15,225	1,117,000	51	6.0	7.5

Table 32

Production from Herd Operations Model for 1967-1977

Year	Reindeer Slaughtered			Dressed Carcass Weight			Fawn Male (70 lb)	Total Weight
	Adult Female	Adult Male	Fawn Female	Adult Female (120 lb)	Adult Male (140 lb)	Adult Female (60 lb)		
67/68	200	400	50	1,500 24,000	56,000	3,000	105,000	188,000
68/69	200	400	50	2,000 24,000	56,000	3,000	140,000	223,000
69/70	200	400	50	2,500 24,000	56,000	3,000	175,000	258,000
70/71	200	400	50	3,000 24,000	56,000	3,000	210,000	293,000
71/72	200	400	50	3,500 24,000	56,000	3,000	245,000	328,000
72/73	200	500	50	4,000 24,000	70,000	3,000	280,000	363,000
73/74	300	500	250	5,000 36,000	70,000	15,000	350,000	471,000
74/75	400	500	500	6,500 48,000	70,000	30,000	455,000	603,000
75/76	1,400	300	4,615	8,368 168,000	42,000	276,900	585,760	1,072,660
76/77	1,800	100	4,612	8,713 216,000	14,000	276,720	609,910	1,116,630

Table 33

Production Efficiency During 1967-1977 Operations Model

<u>Year</u>	<u>Herd Size</u>	<u>Total Production 000's lb</u>	<u>Yield per animal per annum lb</u>
1967/68	9,378	188	20.0
1968/69	10,542	223	21.2
1969/70	12,052	258	21.4
1970/71	14,306	293	20.5
1971/72	17,186	328	19.2
1972/73	20,842	363	17.5
1973/74	25,219	471	18.7
1974/75	29,647	603	20.4
1975/76	30,000	1,073	36.0
1976/77	30,000	1,117	37.1

c) Probable Income from 1967-1977 Operations Model

The income to the operations from the sale of products will be dependent on the supply of meat, the market demand, and the location of the market. It is assumed that when reindeer meat is sold in the secondary and tertiary markets that a lower FOB abattoir price will be realized to compensate for the increased shipping expenses to the more distant markets.

The anticipated meat production from the model and the potential sales are shown in Figure 16. This figure indicates that for the first two years of the model, there will only be enough production for sales mainly to the primary market of the Mackenzie Delta and the Slave Lake areas. For these markets the present 40¢ lb FOB abattoir can be expected. During the next three years an increasing percentage of the meat will be available to the secondary market in the North. For these sales an average of 35¢ lb FOB abattoir can be expected. In the final five years of the model considerably more meat will be for the tertiary markets of the Provinces, Yukon, and export. The probable average return on these sales will decrease to 30¢ lb FOB abattoir for the 6th, 7th, and 8th years and to 25¢ lb FOB abattoir for the 9th and 10th year.

These prices, the available production including the byproduct allowance, and the probable income to the operations are presented in Table 34 for the 1967-1977 operations model. The byproduct allowance was determined by comparing the value of the byproducts relative to the total value of the carcass plus byproducts as shown in Table 35. For the 1965/66 winter wholesale prices the value of the byproducts works out to  $11\frac{1}{2}\%$  of the total value for adults and 14% of the total value for fawns. Since this value is only an estimate and as the value will likely decline in the future when considerably more byproducts are available, a working average of 10% was chosen. This byproduct allowance was then added to the meat production to give a total annual production for the operations.

The potential income for each year in the herd operations model with sales income at the abattoir varying between 25¢ a pound and 40¢ a pound is shown in Table 36.

d) Probable Expenses During 1967-1977 Operations Model

An estimate of the operation expenses for the 1967-1977 model is presented in Table 37.



Table 34

Probable Income from 1967-1977 Operations Model

<u>Year</u>	<u>Market</u>	<u>Average Price FOB Abattoir (\$ per lb)</u>	<u>Production including Byproducts (000's lb)</u>	<u>Probable Income (000's \$)</u>
67/68	Primary	40	207	83
68/69	Primary	40	245	98
69/70	Primary-Secondary	35	284	99
70/71	Primary-Secondary	35	323	113
71/72	Primary-Secondary	35	361	126
72/73	Primary-Secondary-Tertiary	30	399	120
73/74	Primary-Secondary-Tertiary	30	518	155
74/75	Primary-Secondary-Tertiary	30	663	199
75/76	All Markets	25	1,180	295
76/77	All Markets	25	1,228	307

Table 35

Value of Reindeer Components-1965/66 Winter Wholesale Prices

Adult:	Carcass	125 lb @ 40¢ lb	\$ 50.00
	Head	12 lb @ 10¢ lb	1.20
	Legs	4 @ 30¢ each	1.20
	Skins		2.00
	Antlers	5 lb @ 20¢ lb	1.00
	Offal	55 lb @ 2¢ lb	1.10
		Total	<u>\$ 56.50</u>

Components other than carcass	6.50
Percent of Total Value	11½ %
Percent of Carcass Value	13 %

Fawn:	Carcass	70 lb @ 40¢ lb	\$ 28.00
	Head	7 lb @ 10¢ lb	.70
	Legs	4 @ 30¢ lb	1.20
	Skin		2.00
	Antlers	1 lb @ 20¢ lb	.20
	Offal	24 lb @ 2¢ lb	.48
		Total	<u>\$ 32.58</u>

Components other than carcass	4.58
Percent of Total Value	14 %
Percent of Carcass Value	16 %

Table 36

Potential Income from Herd Operations Model 1967-1977

Year	Meat Production lb	Production Including Byproducts lb	Income \$ @ 40¢ lb	Income \$ @ 35¢ lb	Income \$ @ 30¢ lb	Income \$ @ 20¢ lb
1967/68	188,000	206,800	82,720	72,380	62,040	51,700
1968/69	223,000	245,300	98,120	85,855	73,590	61,325
1969/70	258,000	283,800	113,520	99,330	85,140	70,950
1970/71	293,000	323,300	129,320	113,320	96,990	80,825
1971/72	328,000	360,800	144,320	126,280	108,240	90,200
1972/73	363,000	399,300	159,720	139,755	119,790	99,825
1973/74	471,000	518,100	207,240	181,335	155,430	129,525
1974/75	603,000	663,300	265,320	232,155	198,990	165,825
1975/76	1,072,660	1,179,926	471,970	412,974	353,978	294,981
1976/77	1,116,630	1,228,293	491,317	429,403	368,479	307,073

Table 37

Estimate of Expenses for Operations 1967-1977

<u>Expense</u>	<u>67/68</u>	<u>68/69</u>	<u>69/70</u>	<u>70/71</u>	<u>71/72</u>	<u>72/73</u>	<u>73/74</u>	<u>74/75</u>	<u>75/76</u>	<u>76/77</u>
<b>Herd Size:</b>										
End of Year	9378	10542	12052	14306	17186	20842	25219	29647	30000	30000
No. Slaughtered	2150	2650	3150	3650	4150	4750	6050	7900	14683	15225
Production (000 lb)	188	223	258	293	328	363	471	603	1073	1117
<b>No. of Employees</b>										
Herding	8	8	8	8	9	9	9	9	10	10
Slaughtering	6	8	10	11	12	13	17	22	40	42
<u>Operating Expenses</u>										
Salaries	48	43	43	43	48	48	48	48	53	53
Aircraft	19	10	11	12	12	13	13	14	14	15
Fuel	8	9	9	10	11	11	11	13	15	17
Supplies & Equip	8	9	9	10	11	11	11	13	15	17
Slaughtering	9	11	13	15	16	18	23	30	54	56
Sales & Misc.	3	4	5	6	6	8	10	15	30	35
Total	<u>76</u>	<u>86</u>	<u>90</u>	<u>96</u>	<u>104</u>	<u>109</u>	<u>116</u>	<u>133</u>	<u>179</u>	<u>193</u>
<u>Capital Expenses</u>										
Slaughter Houses	33	33	34	2	2	-	2	35	60	61
Reindeer Station	2	2	2	2	7	-	2	2	7	2
Major Equipment	-	1	1	1	-	1	2	2	2	2
Vehicles	-	4	-	4	-	-	5	-	5	5
Total	<u>35</u>	<u>40</u>	<u>37</u>	<u>9</u>	<u>10</u>	<u>1</u>	<u>11</u>	<u>39</u>	<u>74</u>	<u>70</u>
Total All Expenses	111	126	127	105	114	110	127	172	253	263



The number of employees is shown for both herding and slaughtering operations. Since the main emphasis of the operation is the herding of reindeer, the herders are considered as full time employees and the operations manager is included as a herder. The persons hired for slaughtering are considered part time workers who would only be employed during the slaughter period or for specific jobs such as the handling of reindeer skins. The amount of this work will vary with the number of animals slaughtered and the meat produced. It is estimated that  $\frac{3}{4}$  of the amounts estimated for the slaughtering operation will be used for the hire of part time workers (see Table 37) and that each part time worker will receive an average of \$1,000 in a year. Actually, one person could be employed for a series of operations or even be employed full time in the slaughtering operations and earn considerably more than the \$1,000.

Operating efficiency will increase as the herd increases in size. Only two additional herders will be required to handle a herd of 30,000 reindeer than are now required for a herd of around 8,000 reindeer. There will also be improved operating economy as the herd increases as the use of aircraft, fuel and supplies will be spread over a larger production.

The slaughtering expense will be the largest variable in the operations as it can be expected to increase proportionally to the meat production. This expense has been estimated at \$50 per 1,000 lb of meat produced. Presently around \$6,000 is spent for the slaughtering of 100,000 lb of meat. This amounts to \$60 per 1,000 lb. In one of the most efficient United States packing houses, the cost of processing a 660 lb steer was given at \$18.46 (see Table 38). This amounts to \$28 per 1,000 lb. Since the Mackenzie reindeer operations will be handling considerably smaller volumes with less automation, the figure of \$50 per 1,000 lb for the slaughtering operation seems realistic.

Sales and miscellaneous expenses include the costs of salesmen, sales commissions, sales accounting, advertising, and merchandising plus other expenses that do not fit in elsewhere. For particular situations this expense estimate could be used to subsidize shipping expenses for market development or promotional programs. The sales expenses are difficult to estimate since the methods of distribution and the degree of merchandising required have yet to be established for reindeer products. For the first year of the model an allowance of  $1\frac{1}{2}\text{¢}$  per pound was made which works out to 3.75% of

Table 38

Economics of Processing One Steer in Illinois

Selling Price-Carcass 660 lb @ 34¢	224.40
Value of Hides & Byproducts	<u>16.10</u>
Total Selling Price	\$ 240.50
Cost at Stockyard-1073 lb @ 20½¢	219.96
Cost of Processing-Labour	9.50
Overhead	<u>8.96</u>
Total Cost of Processing	<u>18.46</u>
Total Cost	<u>238.42</u>
Net Return on Sales	\$ 2.08

Farm Journal Incorporated, June 1964

Table 39

Net Income and Loss During 1967-1977 Operations Model - 000's \$

<u>Year</u>	<u>Sales Income</u>	<u>Operating Expenses</u>	<u>Gross Margin</u>	<u>Capital Expense</u>	<u>Net Position</u>
1967/68	83	76	7	35	(28)
1968/69	98	86	12	40	(28)
1969/70	99	90	9	37	(28)
1970/71	113	96	17	9	8
1971/72	126	104	22	10	12
1972/73	120	109	11	1	10
1973/74	155	115	40	11	29
1974/75	199	130	69	39	30
1975/76	295	170	125	74	51
1976/77	307	180	127	70	51

the 40¢ selling price. For the remaining years a sales allowance of 2¢ lb was used in the model. This amounts to 5% of the 40¢ selling price and increases to 8% of the 25¢ selling price expected in the final years of the model. Since a higher percentage of the sales in the final years will be shipped to the more competitive market outside of the Northwest Territories, this percentage increase in sales expense is justified.

The expected capital expenses during the herd operations model are shown separately from the operating expenses as they are more flexible in amount and the time that they will be spent. During the first three years an allowance of \$100,000 is shown for slaughter house improvements to meet the "Canada Approved" standard which was reviewed in the slaughter section of this study. Provision is also made in the last three years of the model to spend \$150,000 on improving slaughter house facilities to meet the greatly increased volume of meat that will be handled at this time.

Provision of \$2,000 per year was allowed for general improvements around Reindeer Station except for the year 1972/73 when the cash position will be tight. Provision of \$5,000 was allowed in 1971/72 and 1975/76 for the construction of new houses at Reindeer Station to accommodate new herders.

### Economic Feasibility

The Mackenzie reindeer operation is technically feasible as proven by its continued existence since 1935. The continuity of the reindeer industry in general is well established from thousands of years experience in Scandinavia and Russia, and experience in Alaska from 1899. The pointed question for the Mackenzie reindeer operations is that of economic feasibility in the future.

The probable income and expenses with net position for the Mackenzie reindeer operations over the next ten years in the 1967-1977 operations model are presented in Table 39. These figures indicate that the operations will have an income well above operating expenses throughout the period of the model. However, after capital expenses are allowed for the net position it will be negative for the first three years of the model when new abattoir facilities are being constructed and then will be positive for the rest of the model. A large surplus is indicated for the final years of the model but as most of the present equipment and many of the buildings will require replacement around this time, the actual surplus will probably be considerably less than indicated.



As the second five years of the model are more distant and the sales volumes to be sold are much greater, there is considerable risk in these estimates. In the 6th year the sales volume of 399,000 lb is twice that of the first year of the model. In the 10th year, the sales volume of 1,117,000 lb is nearly six times higher than that of the first year. It would be difficult for any organization in any industry to achieve this sales increase in a ten year period.

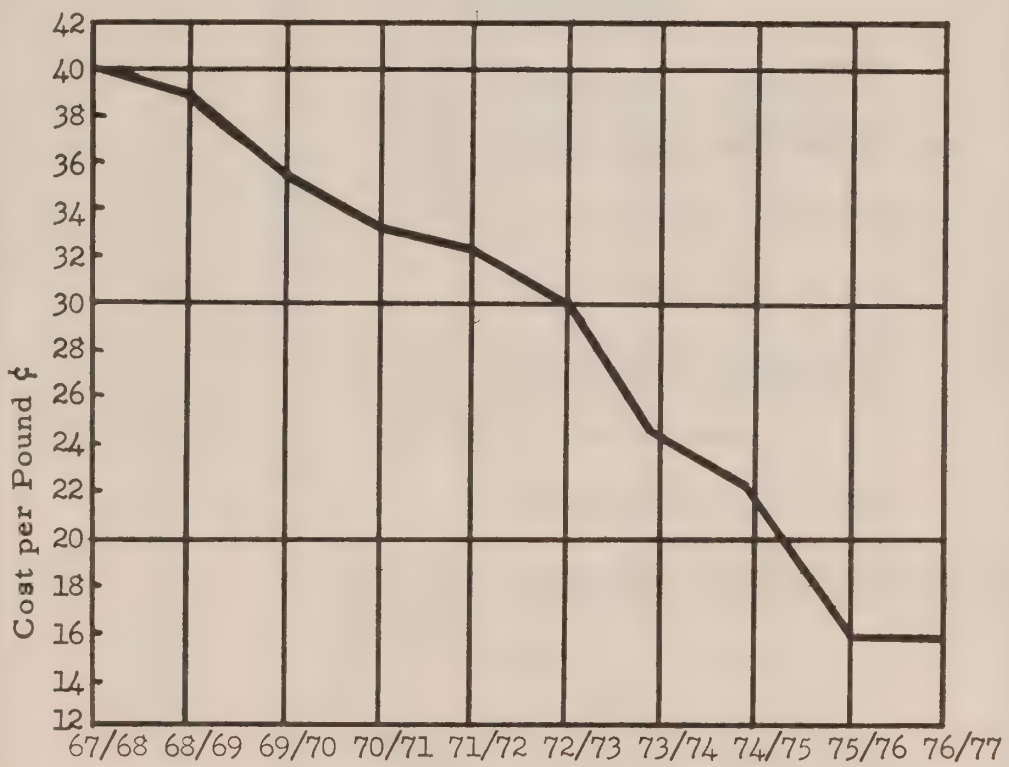
With modern herding methods and suitable slaughter facilities the Mackenzie reindeer operations could operate at the minimum income level of \$60,000 a year. This income requirement could be met by the sale of 150,000 pounds of reindeer meat at 40¢ a pound or 240,000 at 25¢ a pound. This sales volume could be readily realized with sales only in the primary market for reindeer meats.

As the sales volume increases the operating expenses per pound of meat produced in the operations model drop significantly from 40¢ per pound in 1967/68 to 32¢ per pound in 1971/72 and to 16¢ per pound in 1976/77 as shown in Figure 17. These figures compare favourably with the cost of reindeer meat production in Russia which is claimed to vary between 20¢ and 28¢ per pound on the leading collective farms in the Russian North (Andreev 1963). It is noteworthy that the production of beef on the same farms would involve costs four to five times higher than that of reindeer.

The economic summary for the 1967-1977 operations model is given in Table 40.



Figure 17  
Production Costs\* per Pound of Meat Production  
Herd Operations Model 1967-1977



\*includes operating expenses only

Table 40

Economic Summary for 1967-1977 Operations Model

<u>Year</u>	<u>Herd Size</u>	<u>Number Slaughtered</u>	<u>Meat Production 000 lb</u>	<u>Probable Income 000 \$</u>	<u>Operating Expenses 000 \$</u>	<u>Annual Income* \$</u>	<u>Production Cost** ¢</u>
1967/68	9,378	2,150	188	83	76	8.50	40
1968/69	10,542	2,650	223	98	86	9.30	39
1969/70	12,052	3,150	258	99	90	8.20	35
1970/71	14,306	3,650	293	113	96	7.90	33
1971/72	17,186	4,150	328	126	104	7.30	32
1972/73	20,842	4,750	363	120	109	5.80	30
1973/74	25,219	6,050	471	155	115	6.30	24
1974/75	29,647	7,900	603	199	130	6.70	22
1975/76	30,000	14,683	1,073	295	170	9.80	16
1976/77	30,000	15,225	1,117	307	180	10.20	16

\*per animal

\*\*operating expense per pound of meat produced

## VIII THE FUTURE

- Review
- Future Program Possibilities
  - a) Contract Under Government
  - b) Government Corporation
  - c) Private Enterprise
  - d) Reserve Grazing
  - e) Cooperative Organization
  - f) Restriction to Native Ownership
- Basis for Decisions
- General Considerations
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## CHAPTER VIII

### THE FUTURE

#### Review

The Mackenzie reindeer operations form the basis of an industry that can be very beneficial to Northern residents and the Northern economy. The reindeer operations provide quality meat products at low cost, they hire local people, they purchase supplies and equipment on a local basis, and they make productive use of land and vegetation that would otherwise not be utilized.

Studies on the alternate use of Northern lands have concluded that the chief use that can be made of much of the Arctic tundra and adjoining taiga forest is the raising of reindeer (Hanson 1952).

The reindeer are one of the few renewable resources which can be harvested under Arctic conditions. Forestry and fisheries are the only other renewable resources which have been developed in the North or are likely to be developed in the foreseeable future. Forestry and fishing will always be marginal in a Northern setting due to the possibility of more efficient production in Southern areas.

The reindeer industry has a specific advantage over other projects which have been introduced into the North over the past century. Reindeer operations can be carried out only in the North, and reindeer meat will always be a Northern specialty. For this reason the Mackenzie reindeer operations have an excellent chance of success. The reindeer operations are technically feasible as proven by the continuous operations on the Mackenzie Reindeer Grazing Reserve over the last thirty years and experience in other reindeer producing countries.

It is difficult to develop any basic industry in the North related to either renewable or non-renewable resources. There will always be keen competition from comparable Southern industries for both food and mineral products. The reindeer industry is no exception as Southern meats and foods will continue to be shipped into the North with increasingly favourable shipping arrangements. However, an industry that is indigenous to the North, such as the reindeer industry, will have the best chances of success.



Even though the Mackenzie reindeer operations have been carried on since 1935, the present situation is that of a new industry with the requirements of encouragement, capital investment, planning, research, and market development. Because of the favourable geographic and human situation, the Mackenzie reindeer operations have the opportunity to become a modern, large scale, and efficient business in a relatively short period of time. This type of large scale reindeer operation is only realizable in Canada with the possible exception of Russia. Elsewhere, the reindeer industry is complicated by large numbers of people tied to older inefficient methods and operating structures. There are active movements to improve the reindeer industry in these other countries, but because of the complexities the changes will not come readily.

Since the purposes of the Mackenzie reindeer operations are no longer orientated to welfare and the setting up of native herding units, a definite program is needed that will direct the reindeer operations to make the best of its opportunity to develop into a modern self supporting industry. This program for the Mackenzie reindeer operations is required to provide:

- 1) Quality products in sufficient quantities to supply the market.
- 2) Sufficient income from the sale of products for continuity of the operations.
- 3) Effective distribution and merchandising of reindeer products.
- 4) A reasonable standard of living under Northern conditions for herders and their families.
- 5) Effective range and herd management.
- 6) An interest in range and herd management by the herders.
- 7) A research and development program for maintaining and improving production yields from the operations.

There are several alternative programs and combinations of programs which could be set up to achieve these requirements.

The extreme possibility for the future of the Mackenzie reindeer operations is a termination of the reindeer activities. This alternative cannot be taken seriously, but it is considered only for

the sake of completeness. The Mackenzie reindeer operations have been viable for over 30 years and now have the apparent capacity and management capability to be economically self sufficient. Rather than close down the operations to arbitrarily save money, they should be given a chance to become an effective tax paying industry.

If the operations were terminated the reindeer could be merely turned loose to run wild as 'caribou', they could be slaughtered for distribution or sale, or the assets of the operation could be sold to the highest bidder through the Crown Assets Disposal Corporation. The sale of assets to the highest bidder appears to be the most likely move if the operations were terminated. The returns from such a sale are completely unknown but an estimate can be made of the asset values.

There are presently around 8,000 reindeer in the herd. These animals have a value of around \$25 each at the slaughterhouse with the present methods of operation. In the event that the entire herd was sold, they would probably have a sales value of only \$10 per reindeer since an allowance is required for the expense of roundup and handling. The only other operation assets are the buildings and equipment at Reindeer Station. There are eight houses, assorted working buildings, and equipment which would require moving to Inuvik or elsewhere to be of any value. A bid of \$20,000 would be reasonable for the buildings, supplies, and equipment at Reindeer Station. The "going concern" value in the Canadian meat industry based on present sales is only \$10,300 as derived in the introduction of the Operation Economics section of this study.

Since the reindeer operations are relatively unknown outside of the Mackenzie Delta area and the number of potential bidders in the area is quite limited, a high bid of only \$25,000 could be expected at a Crown Assets Disposal sale for the breakup of the operations.

The value realizable from termination appears quite small relative to the future benefits that could be obtained from the continuing of the Mackenzie reindeer operations. With an anticipated payroll of around \$100,000 per year when the herd size reaches 30,000 reindeer, the income tax paid by employees in one year alone could equal the amount realized by the present sale of the operations on termination.

## Future Program Possibilities

### a) Contract Under Government

A contract agreement with the Department of Northern Affairs and National Resources for the management of the Mackenzie reindeer operations has been utilized since 1961. With the contract arrangement it was expected that the operations would develop into a self supporting enterprise. Initially the contractor received a payback of fifty percent of the revenue received from the sales of reindeer products. Since 1 April 1965, on the proposal of the contractor, the payback of revenue arrangement was dropped from the agreement. In general, the contract operation under government has proven very satisfactory as the management had had financial freedom to operate as a business and to introduce modern methods.

Although the initial operating contract was for a period of five years the recent contracts have only been for one and two years. For contract arrangements in the future the period should be extended to at least five years and preferably ten years. Provision should be made for renewal of the contract by the incumbent contractor so that continuity of interest can be established.

The successful utilization of contract agreements in the future for the Mackenzie reindeer operations will depend on the specific terms of the contract and the purposes of the project.

### b) Government Corporation

The setting up of a government corporation to manage the Mackenzie reindeer operations has many advantages of which the most important is financial flexibility. This flexibility is necessary for the reindeer operations where herd management difficulties or marketing opportunities require immediate action. It also insures a correlation between income and expenses. A government corporation would be controlled by government appointed directors and would be subject to government audit.

The government reindeer corporation would be operated by the Department of Indian Affairs and Northern Development formerly the Department of Northern Affairs and National Resources as the Northern Canada Power Commission or it could be set up under territorial government. A territorial set up would have the advantage of being "closer" to the operations than a federal corporation.



c) Private Enterprise

The Mackenzie reindeer operations could be effectively operated in the future by private enterprise. Dr. F. Vallee, Northwest Territories councillor, has stated that "It might be feasible to make an economic go of reindeer herding in the Western Arctic by encouraging private enterprise to take over enlarged herds, and introduce efficient methods of herding, slaughtering, manufacturing, and marketing", (NWT Council Debates, 29th Session, Ottawa, February 1965).

Virtually all of the food in Canada is produced by private enterprise. Since the reindeer operations are an agricultural enterprise responsibility for production and for sale of product is best localized to insure coordination. The private enterprise system will probably serve this function best.

With the Mackenzie reindeer operations organized under private enterprise there is the possibility of participation in the operations by a large number of people. A share corporation could be set up with ownership encouraged amongst the herders and others. A profit sharing plan could be initiated with the operation employees.

However, as no profit has been made by the operations in the past thirty years and virtually no profit is expected for the next five years, any share participation would have to accept the risks of private enterprise and the distinct possibility of there being no profits. The reindeer operations are part of the agricultural industry which will always have an abnormal degree of risk for the production and marketing aspects of the operations.

Under private enterprise employees of the Mackenzie reindeer operations will be able to receive salaries commensurate with the economic success of the operations.

d) Reserve Grazing

The application of Reserve grazing privileges with appropriate fees is a possible program for setting up the future of the Mackenzie reindeer operations. With this program the operations would pay a fee to the Federal government or to the Territorial government for the use of the reindeer Reserve. The fee would be based on the amount of the Reserve used or on the number of reindeer using the Reserve.



Grazing fees are commonly charged for the use of crown or state pastures by private persons or corporations. In Alaska grazing fees for state pastures are charged with rates that vary between 2¢ and 14¢ per animal per month. These fees average out at 5¢ per animal per month (Johnson & Jorgenson 1963). In the interior of British Columbia grazing fees for Crown land in 1960 were charged at the rate of 17¢ per head per month for cattle and  $3\frac{1}{2}$ ¢ per head per month for sheep. For the average annual grazing period of  $4\frac{1}{2}$  months this fee amounted to  $76\frac{1}{2}$ ¢ for cattle and  $15\frac{3}{4}$ ¢ for sheep. Under this program half of the fees collected were utilized for improving the pasture (Weir 1964).

Where grazing fees are usually set up for cattle, sheep, and horses which utilize the pastures for only a few months of the year, there is need for modifications in the case of reindeer which are on the range throughout the year.

For reindeer on the Mackenzie Reindeer Reserve a fee per animal of 50¢ per year would be appropriate. Since the reindeer are on the range throughout the year, a monthly fee is not applicable. With the proposed herd size of 30,000 reindeer, an annual grazing fee of \$15,000 would be paid to the government. This amount would amply cover the right for the use of the land and for the initial outlay of animals and equipment.

An annual count of the reindeer herd size is suggested to ascertain the grazing fees that are to be paid. This count could be made by holding a roundup, aerial photography, or estimates made from ground and air observation. Since the grazing fee per animal will only be a small sum (50¢), strict accuracy of the count should not be required by the government or by the Mackenzie reindeer operations. A count within plus or minus 500 animals should be satisfactory.

It is suggested that the count be made in February or March each year and that the grazing fee payment be made by the end of March. Three persons representing the government, the Mackenzie reindeer operations, and an independent organization such as the Royal Canadian Mounted Police could form a reindeer counting board and establish a number for the herd size each year. This board would not necessarily have to inspect the herd but could accept the data provided by the operation management. Should a counting board not be organized before March 31st of any year, the management of the Mackenzie reindeer operations should have the option to make its own count and pay a fee on it.

e) Cooperative Organization

The future Mackenzie reindeer operations could be organized in the form of a cooperative with the membership made up of persons working with the reindeer. This cooperative concept has been considered previously but a satisfactory method of organization has not been found. When the Teal-Oeming management collapsed in 1961 a cooperative was suggested but because of organizational difficulties, no action was taken. Some of the present herders have indicated an interest in forming a cooperative to control the reindeer operations but no practical proposals have been found.

By definition a cooperative is the self management of an economic enterprise with memberships open to all and benefits given out in relation to participation. Since the reindeer operations are a single unit and the members would be employees of the unit, there are technical issues of management and degree of participation. The cooperative could not be considered as a producer cooperative since the members individually do not produce something that can be measured as in a fishing cooperative. Nor can it be considered a consumer cooperative with only the herders as members since they will only consume a very small fraction of the production.

With a cooperative organization there would be an unsolvable problem of deciding who will make up the membership. If only the present employees of the operations are considered for membership, then all people previously associated with the operations and others will be dissatisfied that they did not have the opportunity of membership.

Since the present Mackenzie reindeer operations require a high productivity per herder in order for the herders to earn a satisfactory wage, there would have to be provision for loss of membership when poor work occurs. This provision would be contrary to cooperative philosophy where membership has to be open to all.

Should the Mackenzie reindeer operations be organized in the future as a cooperative, it can be expected that management support and technical assistance will be required for reasonable continuity and success of the operations. In most Northern cooperatives this assistance has been provided by the government. Since the government has not been able to provide this assistance to the Mackenzie reindeer operations in the past, there is little likelihood that it will be able to do so in the future. The reindeer operations are a specialty and there are few "experts" available in Canada.

Even if management and financial support were provided for a reindeer cooperative as in other Northern cooperatives, it is highly unlikely that the operation would survive long since this arrangement would weaken the strong leadership that is required for the success of the project.

f) Restriction to Native Ownership

The possibility of limiting ownership of reindeer to native people has not been considered as the reindeer now belong to the "Queen". The initial program of the Mackenzie reindeer operations was directed towards Eskimos. In Alaska the ownership of reindeer is restricted to natives and in Sweden and Northern Norway, reindeer ownership is restricted mainly to Lapps (Scotter 1964).

For the future of the Mackenzie reindeer operations, ownership of the reindeer could be restricted to natives but no particular merit is seen in this action and it would be contrary to Canadian tradition. Any form of restriction would tend to limit the effectiveness and flexibility of the operations and thereby lessen its chances for economic success.

With ownership restrictions many needless problems unrelated to the reindeer themselves would arise such as deciding which natives should have the "privilege" of ownership and why some individuals should stand to benefit and not others. Ownership restrictions have not particularly helped the natives of Alaska or the Lapps of Scandinavia who are now caught in the economic bind of owning small inefficient herding units and not being able to do anything about it.

Previous experience with native herding units has shown that the management of a reindeer operation is not particularly suited to any one group of people. A former owner of a native herd unit commented that "We used to live like animals staying out in 50 and 60 below weather and living in tents all year round. With trapping, you can stop anytime and you've got everything", (Wallace Lucas in Edmonton Journal, 18 December 1964).

The senior herder for the operations since the beginning commented that "The Canadian government wanted small herds like in Lapland. The Eskimo people didn't take to it; they weren't much interested. In herding you have to have a love for the animal, to see more than something to eat. This is not natural for Eskimos, because they are huntsmen. Their idea is to kill and eat", (Mikel Pulk quoted in Edmonton Journal, 29 December 1964).



There is the possibility of following the initial objectives of the Mackenzie reindeer operations by again setting up native herd units with an allotment of reindeer. Since the future program requires a large herd size to be economic and as efficient herding will not allow more than one herd on the Mackenzie Reindeer Reserve, there is little hope that small herd units would survive under present conditions with the high demands of productivity. Although there are people capable of herding small reindeer units, past experience dictates that there is more than an ability to handle the reindeer required for a successful enterprise. "Although the terms which were set up were very favourable to the native owners and every assistance has been given to them, they have not adapted to this new way of life" (Cody 1963).

#### General Considerations

Any decisions made which affect the Mackenzie Reindeer Operations in any way should take into consideration the following points:

1. Reindeer are living creatures and their habits cannot be changed by desk decisions.
2. The reindeer operations are an agricultural activity for which due allowance must be made for the variables of nature and weather.
3. Reindeer husbandry has been practiced for thousands of years and there is a substantial accumulation of knowledge on the subject.
4. The reindeer operations are one of the few renewable resource industries in the North which produce income and employ people.
5. Reindeer products are exported from the Mackenzie Delta area and serve to help balance the import of goods into the area.
6. The reindeer operations produce a valuable food product from a landscape and vegetation which would otherwise remain unutilized.
7. The reindeer operations are one of the few businesses in the Mackenzie with all local employees.
8. The reindeer operations are a business in the food industry subject to all the complications of an enterprise such as competition for sales, failure of suppliers, and payrolls to meet.



9. Reindeer Station serves as an administrative centre for its 75 residents and the 80-100 residents of the lower Mackenzie Delta who depend on the Station for communications, emergencies, supplies, and social life.
10. There is an adequate workforce for the Mackenzie reindeer operations in the Mackenzie Delta area and the type of work is natural for local Northerners.
11. Should a road be constructed from Inuvik to Tuktoyaktuk or to Arctic Red River, it will bisect the Reindeer Grazing Reserve and will possibly amplify the problems of poaching. Provision will also have to be made for keeping the reindeer off the roadway.

#### Opportunity for Progress

With the large grazing area available and the absence of conflict with other reindeer herds or industry, the Mackenzie reindeer operations have the opportunity to proceed into a large scale, efficient, and economical operation. The Mackenzie reindeer operations could develop rapidly into a worldwide model of successful reindeer husbandry.

To make the best of the opportunity the Mackenzie reindeer operations must have a capable and powerful management. The operations must continue as a single unit as the setting up of other small herds on the Reserve is now impractical and uneconomical.

A thriving reindeer industry in the Mackenzie Delta area will be an important step towards the development of Northern Canada. The Mackenzie reindeer operations make possible the statement that "There is every reason to believe that the resources of the North can provide an economic base sufficient not only to support its people but also to make a substantial contribution to the well being of Canada and of other parts of the world" (Bank of Commerce Commercial Letter, January-February 1966).

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